The Electrical Industry's Weekly Magazine October 31, 1960

Electrical World

Price 50 Cents A McGraw-Hill Publication

220-Kv Delaware River Crossing Fitted to Air, Marine Traffic...

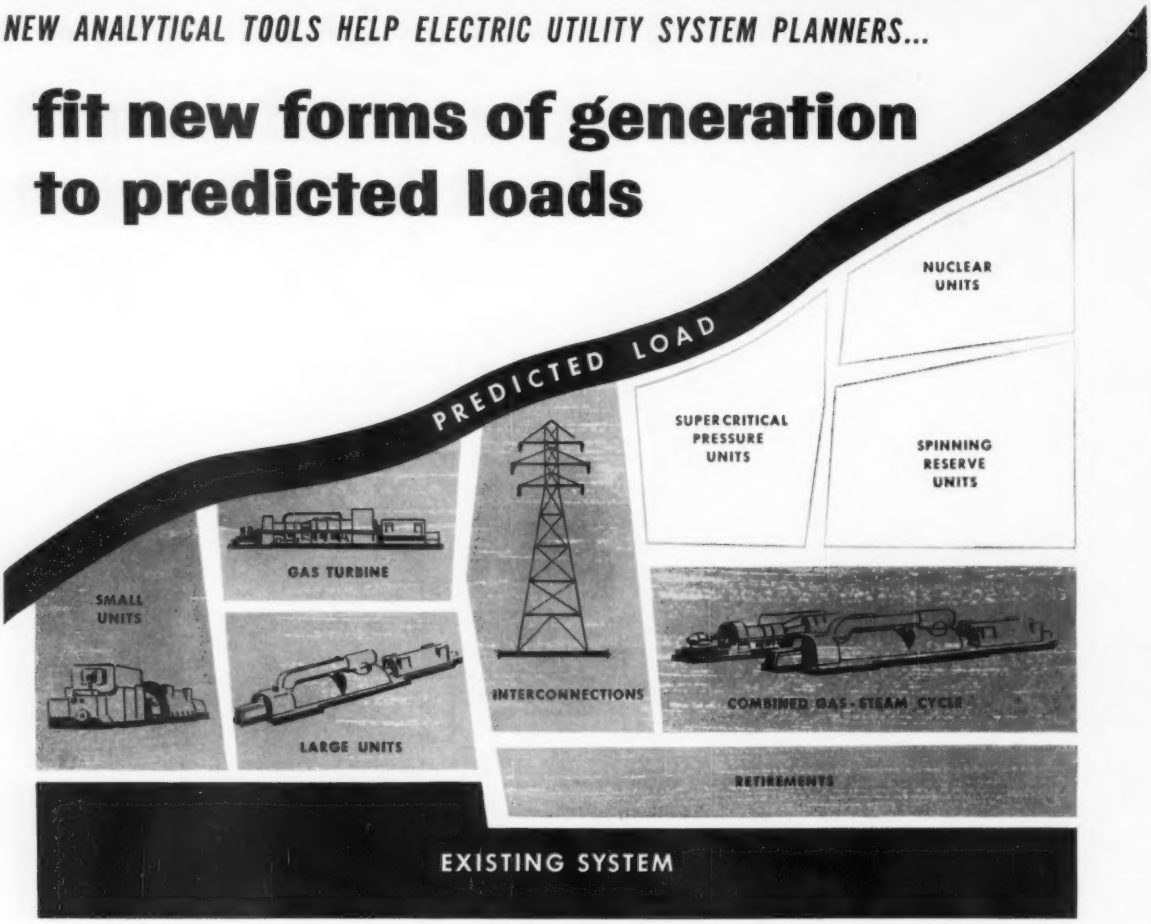
...page 56

AIEE FALL GENERAL MEETING..... page 52

UNIV MICROFILMS INC CS
EDITORIAL DEPT
313 N FIRST ST
ANN ARBOR MICH C 4

NEW ANALYTICAL TOOLS HELP ELECTRIC UTILITY SYSTEM PLANNERS...

fit new forms of generation to predicted loads



POWERFUL NEW MATHEMATICAL TECHNIQUES to analyze the type, size, location, and timing of new power generation facilities have recently been developed by General Electric engineers, working co-operatively with system planning engineers of several electric utilities. These techniques simulate, with a high degree of accuracy, the performance of future systems.

NEW FORMS OF POWER GENERATION, many of them developed by General Electric, now offer electric utilities further cost-saving possibilities. At the same time, vastly different capital-cost and fuel-cost characteristics of new units create a problem of choice. System planners who seek optimum generation expansion patterns are confronted by alternatives more numerous and more complex than ever before.

TO DEVELOP SIMPLIFYING PROCESSES that can counteract processes of complication, electric utility system planners, together with leading electrical manufacturers, have been working to develop more effective analytical tools.

General Electric's new technique, using high-speed digital computers, is the most comprehensive method now available for arriving at accurate cost models of future power generation patterns:

- Units are scheduled on an equal incremental cost basis.
- The computer model accurately represents hourly load variations throughout the period under study.
- Daily load cycles being simulated are continuously modified to accord with days of the week, seasons of the year, and long-term growth trends.
- Units are started and stopped to meet spinning reserve requirements.
- Maintenance is done on the constant-risk principle.

CO-OPERATIVE PLANNING SUPPORT is available to your company. Contact your nearest General Electric Apparatus Sales Office for more information. For a copy of GER-1680, "Computers Aid System Generation Planning," write to the General Electric Company, Section 604-03, Schenectady 5, N. Y.

GENERAL ELECTRIC

Published for 86 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Electrical World

OCTOBER 31, 1960

Vol. 154, No. 18

Electrical What in the World . . .

Through our 86-year history, we've had a strong following of utilitymen doing actual construction, operation, and maintenance. Our surveys and personal contacts show that these boys have a wide interest across all the departments of *Electrical World*.

Still, their special interest naturally resides in their own field. Generations of our editors have considered them a hardcore component of the readership, and have supplied them a steady fare of "nuts-and-bolts" articles. Until recently, these were known as "How-to" stories.

About two years ago, our surveys revealed a broadening of reader interest in this area. So we broadened the scope of the articles, renamed them "Electric Utility Methods" (EUM for short), and increased the output. Now, while almost every issue still carries two pages of EUM's, we run six issues a year which carry about 20 pages per issue of EUM editorial copy.

A percentage of people in this area are innovators, curious, restless, and discontented with methods used down the years. These are the ones we welcome as EUM authors, hoping their publicized examples will spur on those content to live on the reservoir of past accomplishments.

EUM articles aren't easy to collect. The good sources are well spread out. We warmly invite innovators to send in stories, polished or not, to our Methods Editor; or he'd be happy to send details of what's involved and how to go about it, on request.

Chuck Hochgesang

PUBLISHER *Warren W Shew* EDITOR *Charles F Hochgesang*

SENIOR EDITORS *Daniel T Braymer* *Leonard M Olmsted* *Jesse A Mock*

MANAGING EDITOR *Herbert R Frankel*

Engineering

SOUTHEASTERN EDITOR *Edward Allen, Atlanta*

MIDWESTERN EDITOR *Francis J Kovalcik, Chicago*

WESTERN EDITOR *Paul H Leech, San Francisco*

NEW ENGLAND EDITOR *Howard S Knowlton, Boston*

MIDDLE EASTERN EDITOR *Leon A Allen, Jr*

NORTHEASTERN EDITOR *Willard L Folsen*

METHODS EDITOR *Michael G McGraw*

ASSOCIATE EDITOR *George Swift*

OVERSEAS CORRESPONDENT *J H M Sykes, London*

CONSULTING EDITOR *Archer E Knowlton*

News

NEWS EDITOR *Dale VanHorn*

ASSOCIATE NEWS EDITOR *Kenneth N McLean*

ASSISTANT EDITOR *John D Damon*

DIR, NEWS BUREAU *John Wilhelm*

MGR, WASHINGTON BUREAU *George B Bryant, Jr*

Manufacturers and Supply

MFRS NEWS EDITOR *Paul F Roman*

ASSISTANT EDITOR *Elizabeth R Parker*

Art & Production

ART DIRECTOR *Frank C Stockman*

ASST ART DIRECTOR *Wayne A Trapp*

ASSISTANT EDITOR *Steven Ludwig*

EDITORIAL ASSISTANT *Earl J Carter*

Special Services

MGR, MARKET RESEARCH *Arthur J Stegeman*

MGR, ECONOMIC SERVICES *Douglas Greenwald*

Advertising

SALES MANAGER *Walter R Klein*

DISTRICT MANAGERS: *E B Sessions, New York; D J Roberts, Boston; E A Martin, Philadelphia; E F Coffey, Jr, Cleveland; E F Coffey, Jr, Detroit; M S Kearney, Pittsburgh; W H Meneilley, J T Schaefer, Chicago; J T Schaefer, St. Louis; Russell Antles, Los Angeles; R C Alcorn, T H Carmody, San Francisco; Robert H Powell, Atlanta; John Grant, Dallas; F E Holland, Houston; John Patten, Denver; Scott Hubbard, Portland, Ore.*

BUSINESS MANAGER *Otto A Drechsel*

ASST BUSINESS MGR *John F Dugan*

PROMOTION MANAGER *Donald K Ellis*

CIRCULATION MANAGER *E Bryson Sessions*

SERIES ABS

"Sky-Master"

HYDRAULIC AERIAL BEAM

That's right, with the Series ABS Sky-Master workmen can reach out-of-the-way areas quickly and work on or near energized phase lines in complete safety.

Outer beam of the Series ABS is an extra-strong Spirex tube which withstands dielectric testing far in excess of normal requirements. Reinforced plastic work basket has no current-conducting parts or projections . . . provides ample work space and toe room for the operator.

Control levers beside work basket are connected to those on the mast by direct linkage, giving the operator a positive "feel" not possible with secondary hydraulic control-actuating systems.

Dielectric, reinforced plastic rods are installed in the control linkage and basket leveling mechanisms to electrically isolate the basket from the ground.

Modern way to work on energized high voltage lines

The Series ABS is fully-hydraulic in operation, powered by a pump driven by a power take-off on the truck transmission. Outer beam movement in an operating arc of 270 degrees and inner beam movement through a 110-degree arc is independently controlled. Mast can be rotated continuously in either direction. Safety devices prevent unwanted movement when controls are in neutral or if hydraulic system is damaged.

Maximum ground-to-basket floor height is 42′—enabling men to work safely and without fatigue up to 47′ above ground. Wide range of operation permits spotting of the work basket in limitless positions in any direction from the truck. The Series ABS, installed on a Powers-American Body that fits your work needs, can be furnished in two models; Series ABS-1-42 having one basket, Series ABS-2-42 with two baskets.

Another reason why
UTILITIES EXPECT MORE FROM

POWERS American

UTILITY BODIES AND EQUIPMENT

For descriptive literature and price information write . . .

McCABE-POWERS BODY COMPANY

5900 No. Broadway	625 Cedar Street	1461 E. Washington Blvd.	5525 S.E. 28th Ave.
ST. LOUIS 15, MO.	BERKELEY 10, CALIF.	LOS ANGELES 21, CALIF.	PORTLAND 2, ORE.

Letters

The Image vs the Facts

Because of the unusual length of this letter and its bearing on next week's election, we are taking the liberty of commenting on it paragraph by paragraph. Editor's comments are in italics.

To the Editor:

Your editorial of October 10, "The Image Is as Important as the Facts," is one of the most flagrant distortions I have ever read in a supposedly responsible publication. Even your admitted bias against "government power," which I assume includes municipal electric systems and public utility districts as well as TVA and Federal power-producing projects, does not give you license to make misstatements under the guise of presenting facts.

Editor: Electrical World stands resolutely on every statement made in the Oct. 10 *editorial.*

But it is obvious that we may have been projecting an incorrect image ourselves. This is such an important point that we are devoting the editorial comment page (*p* 45) *of this issue to a clear-cut statement of our editorial views and policy on the question of non-investor-owned power.*

Here are some facts, not images:

1. You said: "A 1959 amendment to the TVA Act trimmed nearly $200 million off the TVA debt to the government." This is wholly false, and a publication which specializes in electrical reporting is guilty either of sloppy information or of deliberate distortion in making such a statement. The 1959 amendment to the TVA Act did not trim a cent off the "TVA debt" to the Federal Government. It did change the formula under which TVA had been making cash payments to the US Treasury.

Editor: The Power Annual Report of TVA at page 31 *says, "The required annual repayment of appropriations is* $10 *million a year for the first five years,* $15 *million a year for the next five years, and* $20 *million a year thereafter until* $1.0 *billion of the* $1.2 *billion of appropriations outstanding has been repaid."*

This says plainly to us that more than the repayment

(*Continued on page* 93)

Dateline . . .

Vancouver, B.C.—International negotiations for boosting the Columbia River's power output by building reservoirs in Canada have enjoyed wide publicity for their promise of power to spur the Pacific Northwest's economy. But though the negotiations and the eventual agreements are important in themselves—principally to the Northwestern states whose future power resources they will affect—equally important are two half-obscured byproducts of the agreements which may have a vital effect on utilities throughout the nation.

First of these is the obvious departure from the US government's customary refusal to pay others for upstream improvements. The second is the oft-argued inequity of subsidizing federal projects by charging unrealistically low interest rates.

Upstream improvements usually bring valuable benefits to all downstream hydro plants. As storage, they provide the water to raise minimum flows and bolster firm generation. And as flood control works they reduce high-water damage and minimize the generation curtailment which accompanies high tailwater. Payment for these benefits has long been customary in river system developments. The federal government has assessed charges on downstream plants for upstream improvements. But it has arbitrarily refused to pay for federal gain from non-federal upstream projects.

US acceptance of the proposal to assign to Canada a share of the additional power generated at US plants would set a precedent. Federal power proponents could argue that this precedent is limited by the fact that these Canadian storage reservoirs probably will be Canadian government projects. But they may be asked how they justify a different policy for American citizens whose taxes pay for federal projects.

Interest rates enter the picture as part of the

(*Continued on page* 51)

ELECTRICAL WORLD
Vol. 154, No. 18 October 31, 1960

Published weekly by McGraw-Hill Publishing Co., Inc., James H. McGraw (1860-1948), Founder. Executive, Editorial, Circulation and Advertising Offices: McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y. Printed at 99-129 North Broadway, Albany 1, N. Y. See panel below for information regarding subscriptions or change of address.

Officers of the Publication Division: Nelson L. Bond, President; Shelton Fisher, Wallace E. Truesdly, Senior Vice Presidents; John R. Callaham, Vice President and Editorial Director; Joseph H. Allen, Vice President and Director of Advertising Sales; A. R. Venezian, Vice President and Circulation Coordinator. Officers of the Corporation: Donald C. McGraw, President; Joseph A. Gerardi, Hugh J. Kelly, Harry L. Waddell, Executive Vice Presidents; L. Keith Goodrich, Vice President and Treasurer; John J. Cooke, Secretary.

Subscriptions are solicited from executive, supervisory, and engineering personnel in electric utilities, manufacturing companies, and related fields; and from consulting engineers and electrical engineers in industry. Position and com any connection must be indicated on subscription orders. Send to address shown in box at right.

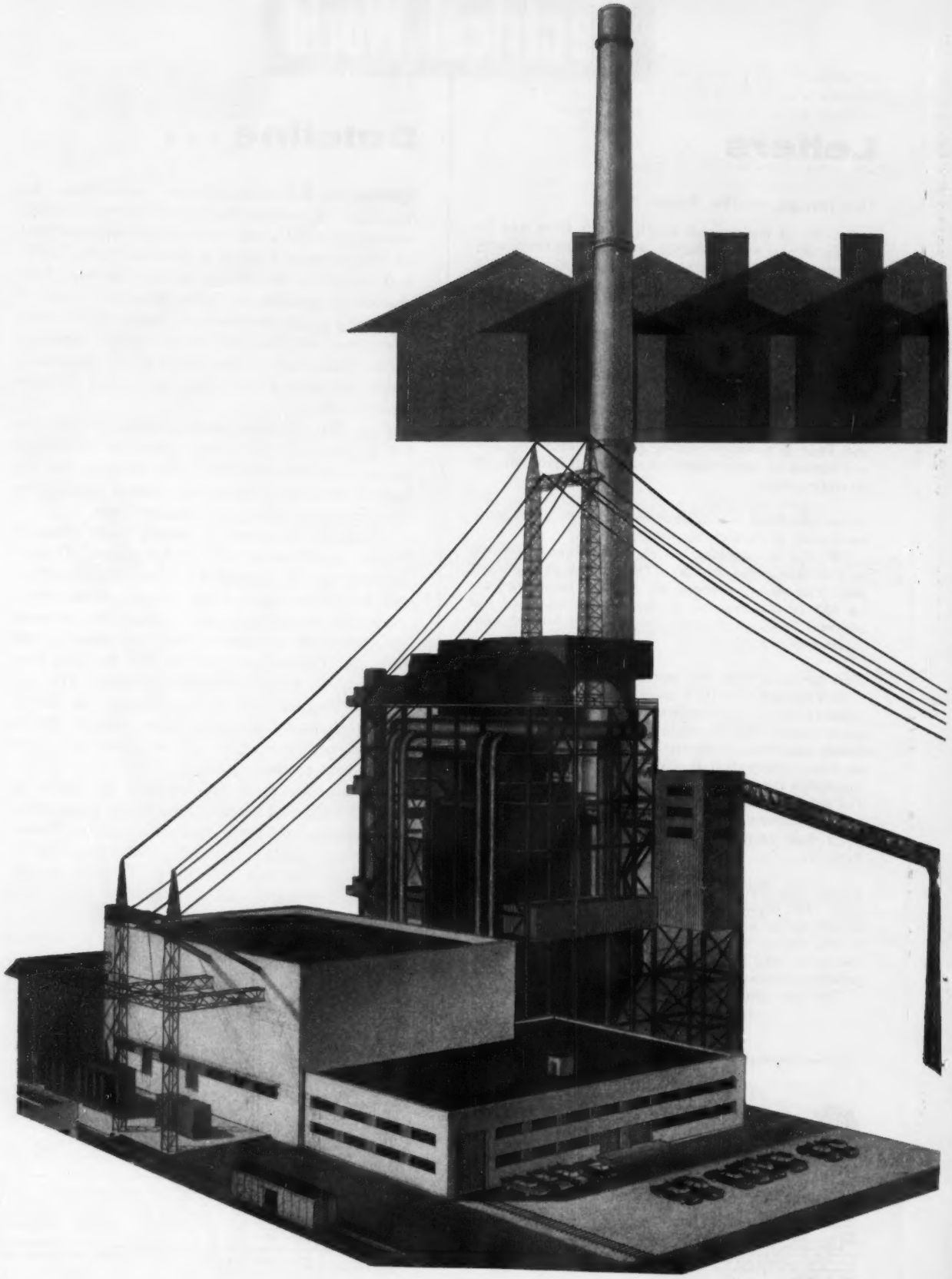
United States and Canada subscription rate for individuals in the field of the publication $6.00 per year; single copies 50 cents. Other Western Hemisphere and the Philippines $20.00 payable in advance and other countries $30.00 payable in advance.

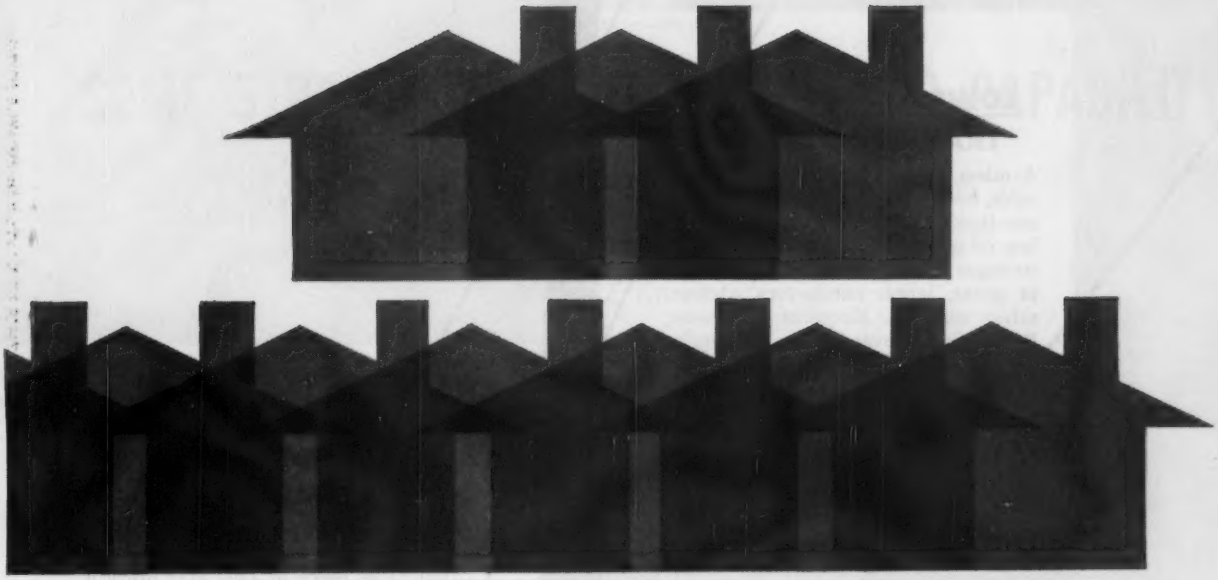
Second-class postage paid at Albany, N. Y. Title registered in U. S. Patent Office. Copyright 1960 McGraw-Hill Publishing Company, Inc. All rights reserved Permission required to reproduce any of contents. Printed in U. S. A.

Unconditional guarantee: Our primary aim is to provide subscribers with a use ful and valuable publication. Any comments or suggestions for improvement will be most welcome. On written request from any subscriber, the publisher agrees to refund the unused portion of the subscription price.

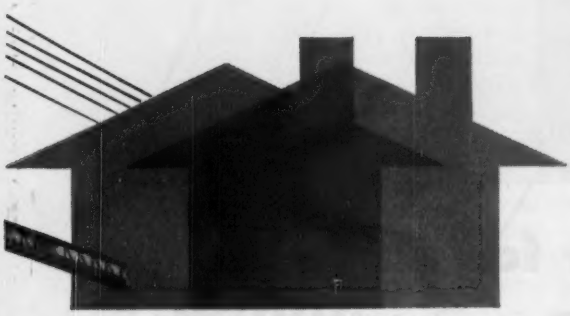
SUBSCRIPTION AND ADDRESS CHANGES: Send subscription correspondence and change of address to Fulfillment Manager, ELECTRICAL WORLD, 330 West 42nd Street, New York 36, N. Y. Subscribers should notify Fulfillment Manager promptly of any change of address, giving old as well as new address, and including postal zone number, if any. If possible, enclose address label from a recent issue of the magazine. Please allow one month for change to become effective.

Postmaster . . . Please send form 3579 to Electrical World, 330 W. 42nd St., New York 36, N. Y.





Electricity for an additional 130,000 homes ...without burning an extra ounce of coal!



The addition of two new Universal Pressure® Steam Generators —one now on-the-line at the American Electric Power System's Breed Plant, the other under construction at AEP's Philip Sporn Plant—marks a major milestone in the expansion of power utilities to meet America's surging demands for electricity.

Together, these units will provide steam at supercritical pressures (3500 psig at 1050 F/1050 F/1050 F) to generate about eight billion kilowatt hours of electricity annually. Each of these steam generators will consume a carload of coal every twenty minutes. Because of the improved cycle efficiency of these units, electricity generated from this fuel will be sufficient for the annual needs of over two million average American homes—130,000 more homes than could be supplied by burning the same amount of coal in the best generating stations now in operation in the world.

Net power of these stations is about twice that produced annually at Hoover Dam . . . yet cost of putting these new plants on stream (per kilowatt of electricity) will equal about ⅓ that of building a new Hoover Dam today.

Expansion is the measure of the future — and products of Babcock & Wilcox engineering and research will pace much of the nation and the utilities industry.

For more detailed information on the UP® Steam Generator and other B&W power generating systems and designs write: The Babcock & Wilcox Company, Boiler Division, Barberton, Ohio.

G956-A

B&W

THE BABCOCK & WILCOX COMPANY

BOILER DIVISION

LOWEST-COST TRANSMISSION LINE

Armless pole design eliminates crossarms, braces, hardware . . . saves up to one-third in material . . . more in labor of erection. Because insulator is stronger than crossarm, permits longer spans, larger conductors, greater safety margins. Requires narrowest ROW. Easiest-ever for hot-line work.

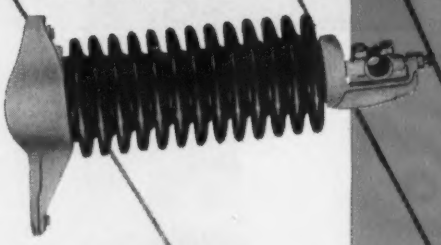
BEST-PERFORMING TRANSMISSION LINE

Horizontal mounting of Line Post encourages uniform wetting and self cleaning, improves wet flashover values by as much as 15% over upright ratings. Eliminates contamination flashover and pole-top burning.

BEST-LOOKING TRANSMISSION LINE

Neat, unobtrusive appearance avoids customer objection in urban and suburban residential construction. Can handle 69 kv, or higher, yet looks more like a "small" distribution line. Permanently free of RIV and TV interference, too.

the insulator for armless transmission



Lapp Line Posts with clamp-top and integral-base-and-gain for horizontal mounting are available in voltage ratings of 35 kv, 45 kv, 55 kv, 66 kv and 88 kv. Each insulator is held by two through-bolts, and entire structure is easily assembled on the ground before erection.

Lapp

Modern armless construction with Lapp Line Posts is explained in detail in the new Lapp Catalog No. 8. Write for your copy. Lapp Insulator Co., Inc., LeRoy, N. Y.

(Advertisement)

SOME STRAIGHT FACTS ON OVERLOAD CAPABILITY

A Frank Statement About Current Announcements on Overload Capability, by R. D. Nelson, President of RT&E Corporation

During the past several months, distribution transformer marketing has been clouded by two so-called "new features" — (1) overload capability and (2) high temperature insulation.

At RT&E, we believe that multiple ratings and 55°C-65°C rise have done a great disservice to the industry by creating an impractical "double standard" that serves only to confuse transformer buying and application.

This "double standard" has resulted in claimed increased capabilities of varying amounts, some by 12%, some by 15% and others by 20%. To the utility engineer these multiple KVA ratings and 55°C-65°C temperature rise mean that each new transformer purchased must be treated apart from other makes and vintages already installed. This, we feel, makes for an impossible situation which instead of alleviating, greatly complicates an already growing utility problem of inventory control.

We believe in new development too, but we also believe that transformer engineering and design should be aimed at what the *customer* really wants: transformers that are smaller in size and at reduced costs.

Here at RT&E overload capability *is* important and necessary . . . *not as an end in itself* . . . but only as a step toward future design and manufacture of smaller transformers at lower costs. Mutiple ratings are not a step in this direction.

Two developments — wound core construction and high temperature RTEX insulation — were key factors in RT&E's pioneering in overload capability, with the result that SINCE MAY 1, 1954, ALL RT&E DISTRIBUTION TRANSFORMERS HAVE HAD 15% OR MORE OVERLOAD CAPABILITY.

Field proof of high overload capability and high temperature insulation built into RT&E transformers the past six years, while rewarding to all of us at RT&E, has not completely satisfied us. In addition to in-service field testing, we have been participating in thermal evaluation tests. These accelerated tests have subjected transformers to extreme overload conditions followed by short circuit and then tests of lightning impulse, high potential, and over excitation. During two years of continuous testing RT&E transformers refused to fail, and were finally taken from the test line.

Yes, RT&E transformers have overload capability and high temperature insulation . . . and have had these "new features" since 1954. However, we will not multiple-rate transformers, nor will we merchandise 65°C rise until it is adequately defined and formally standardized. In the meantime, customers can be sure that all RT&E transformers, both pole type and Terra-Tran, have overload capabilities equal to or greater than any other transformer rated at 55°C-65°C.

Most important to us is the basic premise foremost in our philosophy— RT&E engineering concentration on a single idea to give our customers what they want and need . . . *better transformers that are smaller in size and at reduced costs.*

vv

RT&E Corporation • Waukesha, Wisconsin • Portland, Oregon • Arlington, Texas

2170 SUBSTATIONS AND 40 YEARS LATER...

SOUTHERN STATES IS STILL LOOKING FOR THE MAGIC FORMULA

A great deal has been said about *standardized substations*. As much as we like the basic idea, the one thing we have learned is that there is no cut-and-dried, assembly-line, easy way to produce substations on an industry-wide basis.

We've been at it 40 years, producing more than 2170 substations of all kinds, and it has always been tough for us!

Even stations with essentially the same assignments have endless arrangements. Infinite combinations of design preclude standardization in the true sense of the word. The exception is where individual utilities have developed their own standardized substation programs. Otherwise substations must be virtually custom-made.

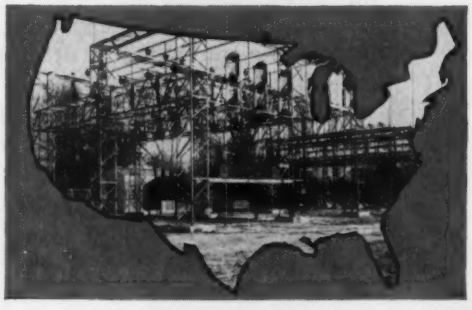
True, hundreds of designs in our files are helpful. Many standard components are picked up and used, with ultimate savings to our customers. And the years of practical experience of our design staff guides us, and our customers, around many pitfalls.

But you can't escape the fact that supplying substations requires these basic functions: skillful engineering, careful detailing, precise coordination of production schedules, and delivery on time. At least, that's what we've learned 2170 substations and 40 years later. And that's how we approach every substation assignment.

On this basis, you might like to do business with us. We'll welcome your inquiry. Just call your Southern States representative or write to us direct.

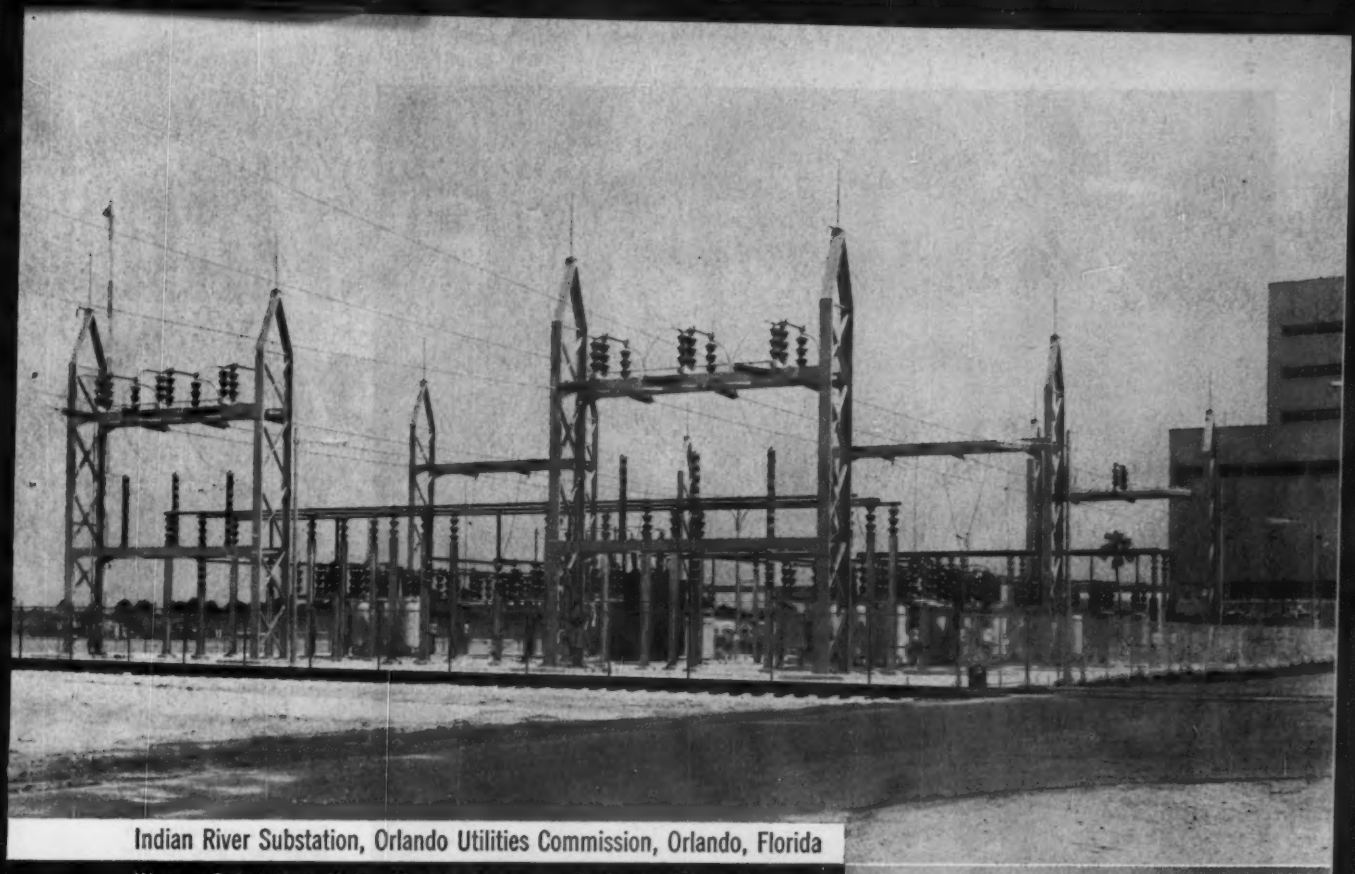
SOUTHERN STATES SUBSTATIONS ARE IN USE ALL OVER THE NATION

During the past 40 years Southern States has produced 2170 outdoor substations for hundreds of different customers. They range from small 5000 kva units to switchyards exceeding 1-million kva, and include substations for the nation's newest atomic systems. Regardless of size, Southern States scrutinizes every detail —from single-line wiring diagram to the finished station.



SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

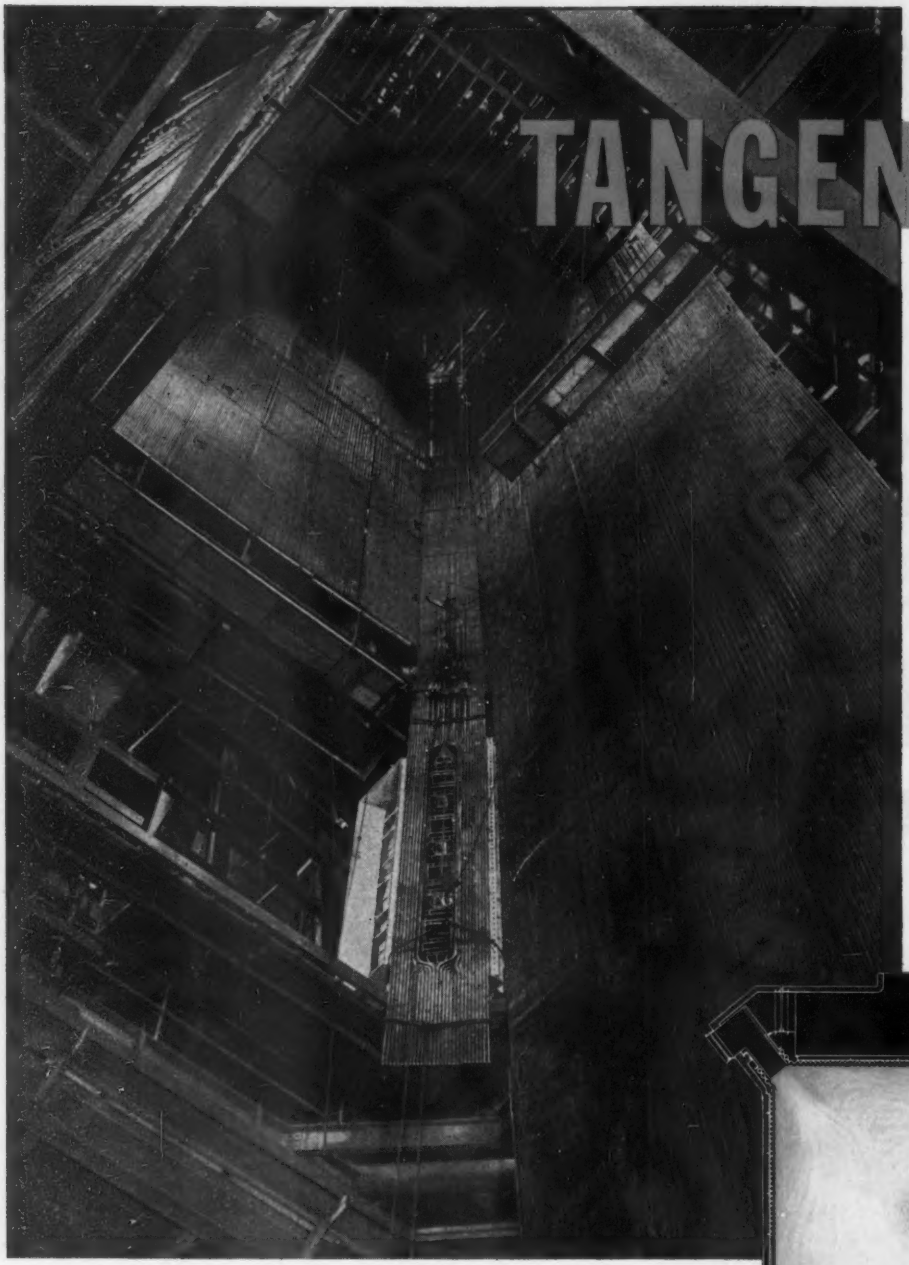
IN CANADA: Dominion Cutout Co., Ltd., Toronto



Indian River Substation, Orlando Utilities Commission, Orlando, Florida

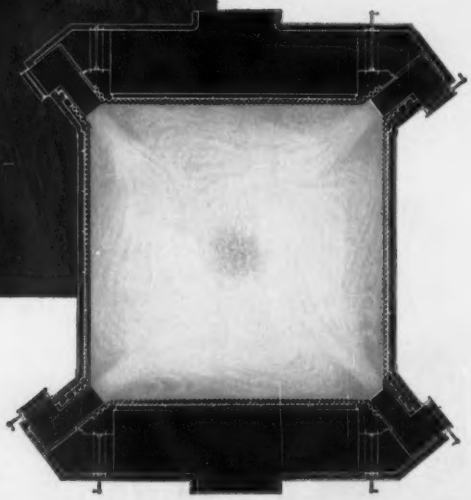
Warson Substation, Union Electric Company, St. Louis, Missouri

TANGENTIAL



Looking up into the furnace of a C-E Controlled Circulation Boiler. One of its four Tilting, Tangential Burners is being moved into position. The burner and its adjacent water wall tubes are shop assembled into a single panel and handled as one piece. All four corners of the furnace are similarly equipped. Tangential burners may be arranged to burn coal, oil or gas separately or in combination.

Sectional plan view through tangentially fired furnace showing impinging action of fuel streams from the burners which results in extreme turbulence and thorough mixing of fuel and air.



COMBUSTION

General Offices: Windsor, Conn.

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS;

FIRING...
best for big boilers

Tangential firing – an exclusive C-E development–was introduced by Combustion in 1927. The tilting feature of the burner nozzles, for control of superheat temperatures, was added to the basic design in the late thirties. Among the many proven advantages of the C-E Tilting, Tangential Burner, those enumerated below are especially noteworthy – whether the fuel be coal, oil or gas, or combinations thereof.

Combustion is better

1. The extreme turbulence created by impinging flame streams of adjacent burners assures the most effective mixing of all the air with all of the fuel to produce the most rapid and complete combustion. Minimum carbon loss is assured.
2. The swirling rotating travel of combustion gases fills the furnace cross-section and utilizes the heat absorbing wall surfaces most effectively.

Superheat is controlled

1. If steam temperature goes too high, the C-E Tilting Tangential Burner nozzles automatically tilt downward. More furnace wall surface becomes effective. Gas temperature to superheat surface is lowered. Steam temperature comes down.
2. Conversely, if steam temperature drops below that efficient for the turbine, nozzles tilt upward, sending hotter gases to the superheater. Steam temperature goes up – automatically.

Acceptance is widespread

About 650 tangentially fired C-E Boilers with an aggregate capacity of about 400-million pounds of steam per hour are now in service; another 85 units are under construction or on order. In 1959 alone 31 new C-E Boilers with an aggregate capacity of over 5-million kilowatts were put in operation in electric utility plants. All of these units are tangentially fired.

Thus, tangential firing has established itself in service over a period of many years as the most widely accepted method of firing for big boilers. More recently it has met similar success in smaller oil and gas fired units for capacities as low as 70,000 lbs. of steam per hour. Catalog PC 8 gives full information. May we send you a copy?

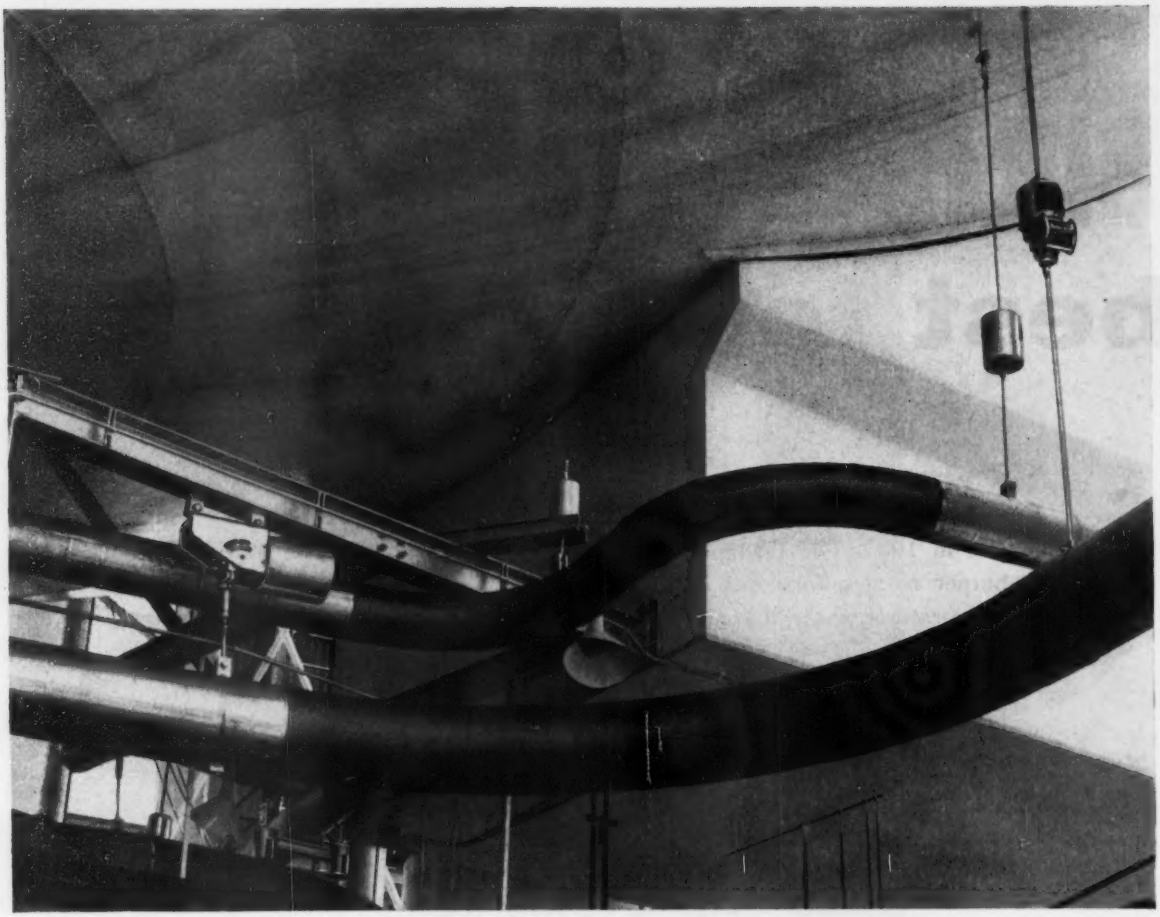
ENGINEERING

New York Offices: 200 Madison Ave., New York 16

C-E

C-263

PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE



Grinnell Spring Hangers support the pipes carrying steam from the heat exchangers to the turbines.

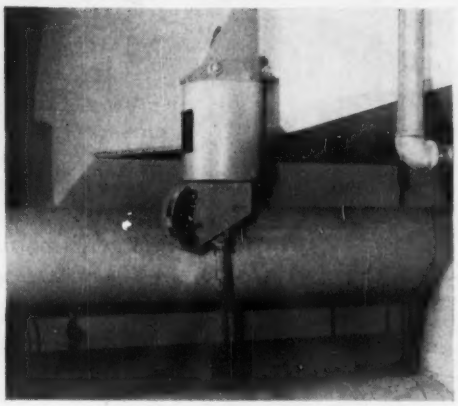
Grinnell Hangers cradle high-pressure piping at new Yankee Atomic Power Plant

At the new Yankee Atomic Power Plant in Rowe, Mass., uranium fuel in the nuclear reactor keeps the water which flows through the reactor at about 500° F. This pressurized water, at 2,000 pounds per square inch pressure, transfers the heat through piping to a steam generator where steam is produced for running power turbines.

Piping that undergoes such high pressures and temperatures must have rugged, *reliable* support. Chosen for this tough job: Grinnell Pipe Hangers!

Grinnell Constant Support Hangers are used where reactive forces at terminal points must be kept within specified limits. Grinnell Variable Spring Hangers are used where piping is subject to vertical movement and does not require a constant support type.

For a complete line of engineered pipe hangers and supports . . . for skilled advice and assistance . . . for experienced field engineering service . . . call on Grinnell Company, 277 West Exchange St., Providence 1, R. I.



Turbine extraction lead gets support from Grinnell Constant Support Hanger

GRINNELL AMERICA'S #1 SUPPLIER OF PIPE HANGERS AND SUPPORTS

Pipe Fittings, Valves, Pipe Hangers, Prefabricated Piping, Unit Heaters and Piping Specialties • Branch Warehouses and Distributors from Coast to Coast

HAS

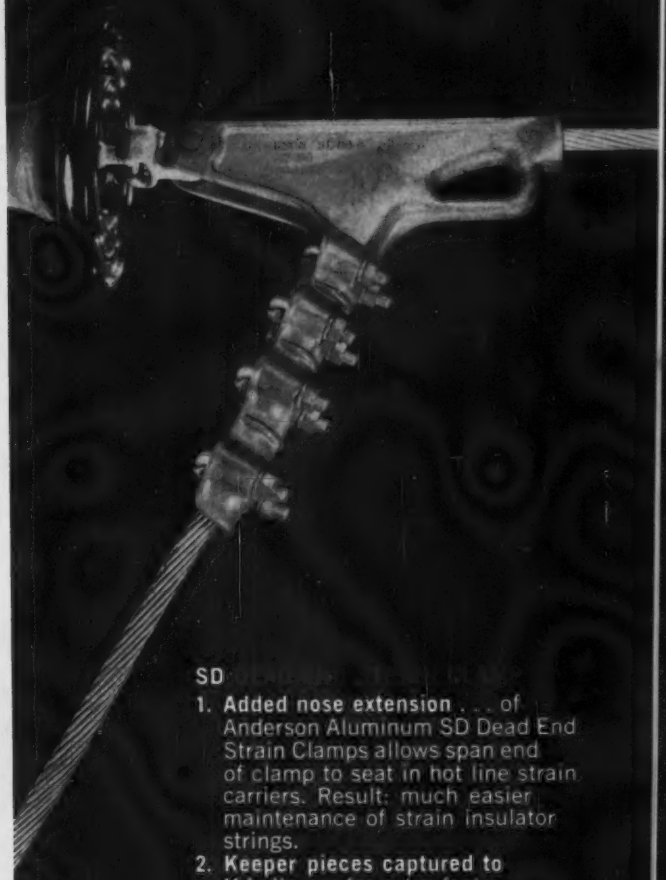
Cast from high-strength, non-corrosive aluminum alloy, Anderson HAS Suspension Clamps minimize heat build-up . . . save 90% or more of power losses prevalent in ferrous clamps. In addition, superior Anderson design gives you extra strength with lightest possible weight . . . eliminates destructive damping effect of vibration at the suspension point.

OUTSTANDING ANDERSON DESIGN FEATURES:

- Flared mouth prevents chafing
- Clevis pin locked against rotation
- Speed cotter key facilitates maintenance while energized

COOL CASE

of better suspension



SD

1. **Added nose extension** . . . of Anderson Aluminum SD Dead End Strain Clamps allows span end of clamp to seat in hot line strain carriers. Result: much easier maintenance of strain insulator strings.
2. **Keeper pieces captured to U-bolts** . . . for extra fast installation. No need to cut cable for insertion . . . no disassembly required.

SMOOTH CASE

of better deadending

Anderson keeps power up, heat down

ANDERSON ELECTRIC

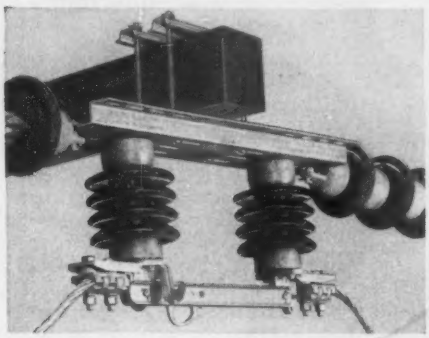
Research / Quality / Performance / in Aluminum and Bronze Products

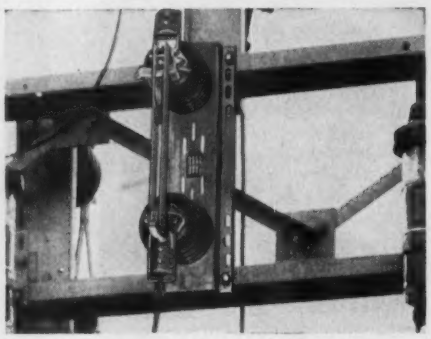
ANDERSON ELECTRIC CORPORATION, P. O. DRAWER 2151, BIRMINGHAM 1, ALABAMA

The New DS-DSB . . .
most adaptable switch of its type

I-T-E's new contribution to low-cost hook-operated switching

From base to blade, this rugged new switch provides unmatched adaptability to meet all of your specific requirements . . . at a new low cost. The DS-DSB makes no compromise with quality. Options in the selection of key components let you buy only as much switch as you need . . . nothing more, nothing less! It meets all NEMA electrical and mechanical requirements for hook-operated switching from 7.2 to 23 kv, 400 and 600 amperes. Check out this inexpensive "full performance" switch carefully and see for yourself!





The base is universal, providing double-crossarm mounting as shown on the facing page; or a rigid, double-bracket, single-arm mounting as shown at left above; or through-bolt mounting on steel (as shown at right above), or wood.

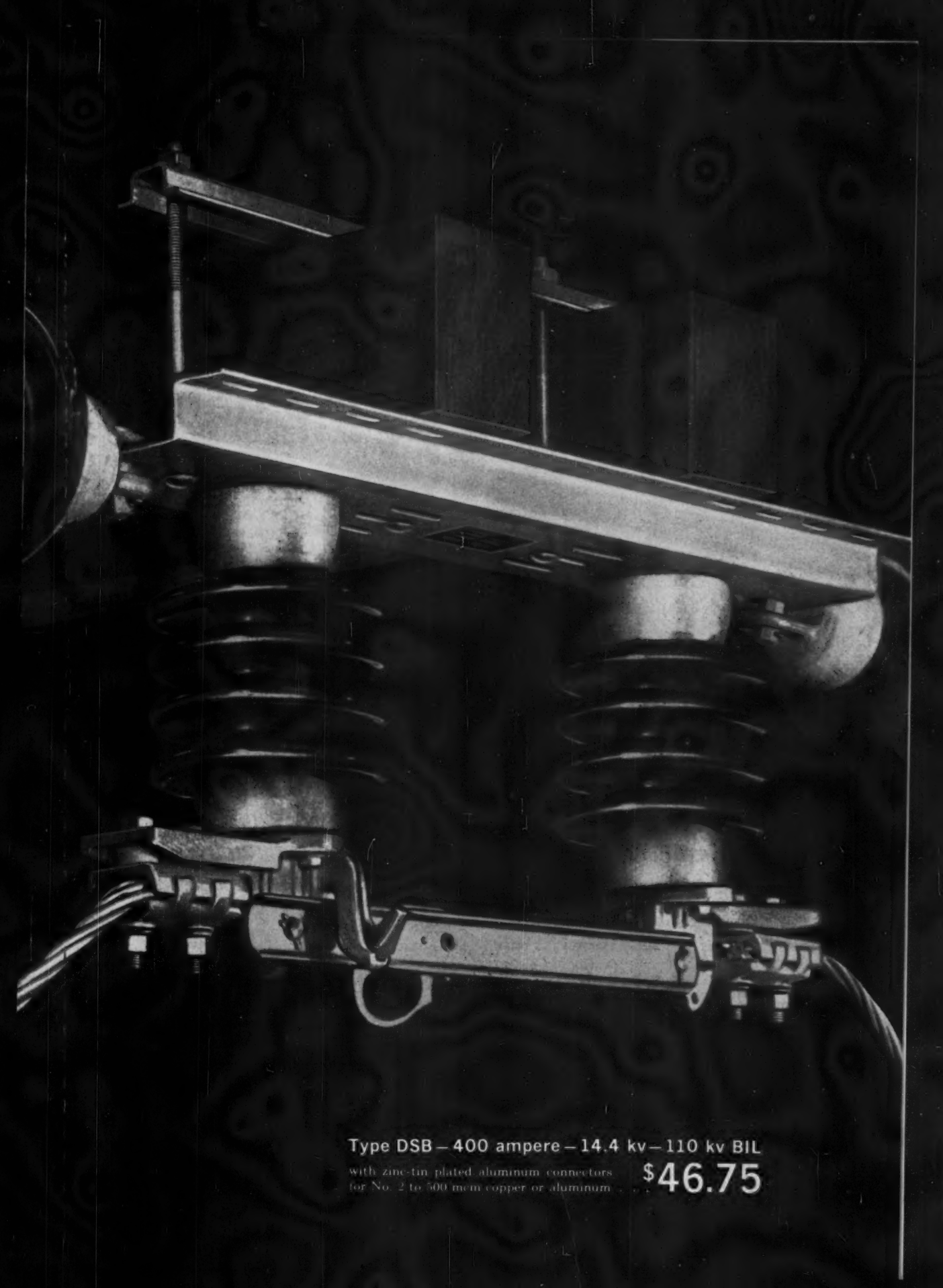
Loadbreak tool (S&C Loadbuster) operation is optional, with hooks to convert from DS to DSB shipped with each switch when specified.

The full line of these new, low-cost, Type D-insulated, NEMA rated switches are available from I-T-E warehouse stocks. All of the standard connectors, for aluminum and/or copper, are stocked with the switches.

IN ITS VOLTAGE AND CURRENT RANGE, THE DS OFFERS MAXIMUM VALUE AND PROVEN PERFORMANCE

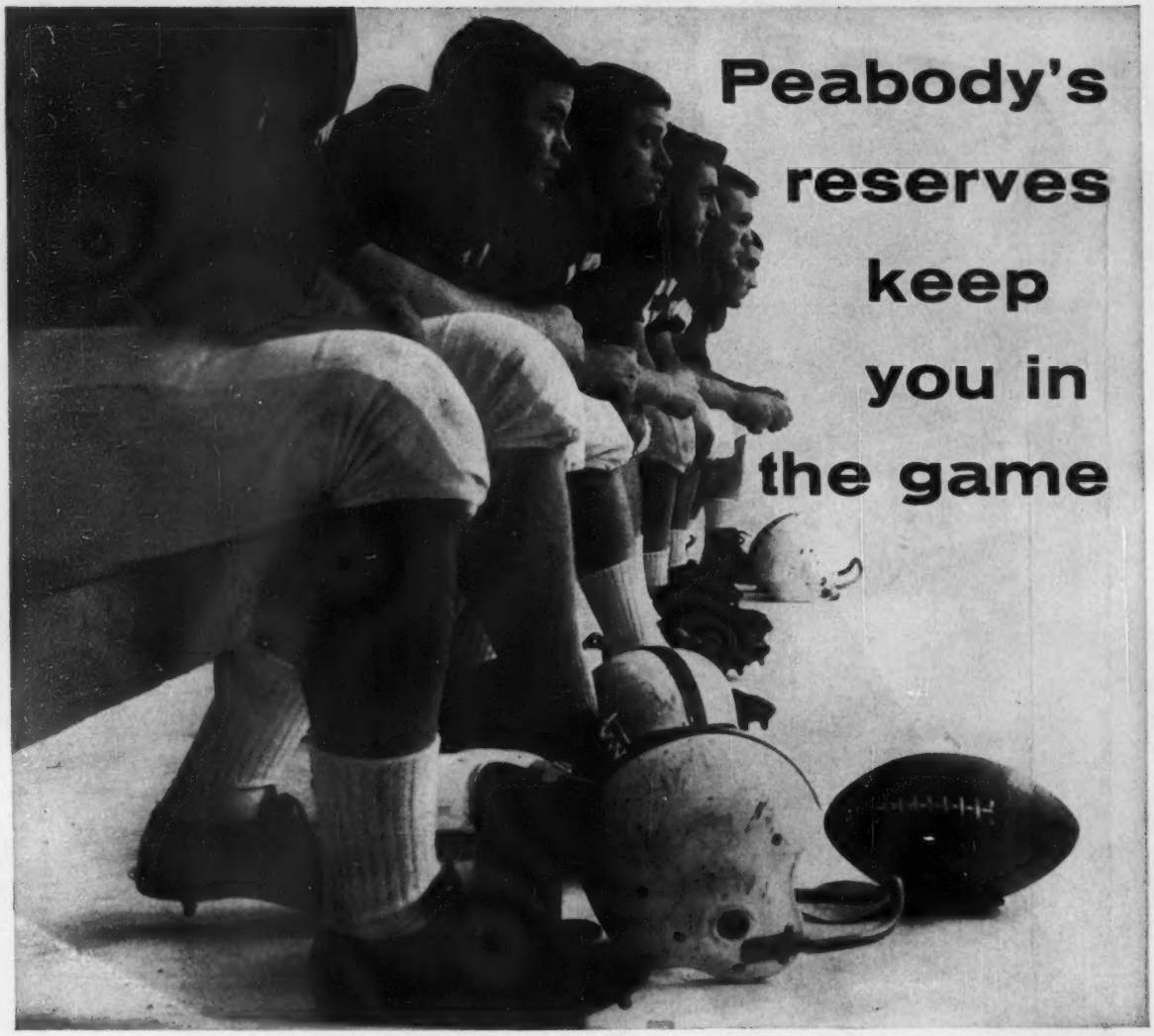
Get complete information. Ask your local I-T-E representative for a demonstration, and a copy of Bulletin 1030A—or write for information to Greensburg Division, I-T-E Circuit Breaker Co., Greensburg, Pa.

I-T-E CIRCUIT BREAKER COMPANY



Type DSB – 400 ampere – 14.4 kv – 110 kv BIL

with zinc-tin plated aluminum connectors for No. 2 to 500 mcm copper or aluminum . . . $46.75



Over Two Billion Tons Of Proven Reserves Assure You An Abundant Coal Supply Far Into The Future!

High productivity takes *Power*—and *plenty of it*—the kind of long-range power made possible by *Peabody's two billion tons of proven coal reserves.* This vast fuel reservoir . . . large enough to light and power the city of Chicago for 200 years . . . can be a dependable source of power for your Company in the years ahead. Peabody's continuous development of productive mining properties . . . economically accessible to the nation's inland waterways and rail facilities . . . assures you of long-term availability and diversified selection.

Make sure you have access to this virtually inexhaustible fuel reservoir. Contact your nearest Peabody office for complete details.

Learn more facts about Peabody Coal . . . its importance to the nation's economy and your business. Send for Peabody's new FREE booklet, "COAL . . . ANCIENT STOREHOUSE OF MODERN LIVING." Write Department EW.

power for progress

PEABODY COAL COMPANY

Peabody Plaza • 301 Olive Street • St. Louis 2, Missouri

Offices in: Chicago, Columbus, Des Moines, Detroit, Indianapolis, Kansas City, Louisville, Madison, Wis., Memphis, Minneapolis

WESTINGHOUSE POWERCASTING* predicts super-capacity plants... demanding automatic operation

Load growth is accelerating. To meet demands, utilities will continue to add generation capacity in ever larger units. Accompanying the super-capacity of equipment is its increasing complexity, far greater instrumentation, mounting need for reliability.

To control this massive, and expensive, facility efficiently or even adequately is fast approaching the limits of human ability. Emergency conditions bring the problem into critical focus. Operating variables throughout a typical station number in the hundreds. It is virtually impossible for personnel to assimilate all necessary data, to analyze and translate it quickly into the best course of action. Hurried decisions based on hasty scanning of complex interrelationships by operators under great stress make the possibility of major equipment damage a constant threat. Records indicate that chances are one in three a major accident will occur in the lifetime of your plant.

The cost of a single major outage due to operator error can easily exceed the total cost of a completely automatic control system. The automatic steam plant is coming because it must . . . to make your huge capital investment in generation operationally economical, reliable, safe for men and equipment.

*A Service-Mark of Westinghouse

Westinghouse

WESTINGHOUSE POWERCASTING* Westinghouse program of product development concentrates on automatic power plant

Prodac† means PROgrammed Digital Automatic Control. It is a high-speed computer designed specifically for steam station system control. Here are just a few of the unique services Prodac can perform for you.

Special logic unit and priority director simplify and expedite the making of thousands of decisions required for sequencing and control of a generating unit. Sequencing changes are made automatically whenever needed to start up, shut down or run at maximum efficiency under either normal or emergency conditions.

Prodac rapidly and continually scans and logs all necessary system variables, keeps up-to-the-minute records. By extensive calculations, this information is presented in meaningful heat rates and unit efficiencies. After analysis, required changes are made automatically to optimize performance of the entire plant.

All sub-loop control systems for the turbine-generator, boiler, fuel, feedwater, and all other plant systems are completely coordinated and integrated in Prodac.

Plant reliability is greatly improved with special stored programs with which Prodac can at any time take high-speed corrective action, under both normal and emergency conditions. Operator error has been designed out.

Availability of each turbine unit is significantly increased by reducing start-up time, cutting down time. Maintenance is cut appreciably . . . plant equipment limits are not exceeded.

Manpower requirements are reduced because of the computer's ability to observe and interpret large

quantities of data, and to perform a multitude of control functions . . . unattended.

Because of Prodac's high speed, immense capacity and many exclusive functions, these and other rewards are available to you from Westinghouse.

Turbine and generator section

New sub-loop controls equip Westinghouse turbine-generators for automation.

These new devices and subcontrol loops are necessary to adapt the turbine-generator for control by digital computer.

A wide-speed range governor, utilizing a magnetic pickup and static control equipment, has been developed for use during turbine-generator start-up. It controls shaft speed to the value dictated by the computer start-up program.

The automatic turning gear automatically engages the gear and starts the motor when the rotor comes to rest. The "at rest" condition is detected by a hydraulic zero speed indicating device.

The lube oil, seal oil and hydrogen systems are equipped for complete automatic operation.

A capability curve regulator has been developed to assure that the generator always operates within the capability curve of the generator.

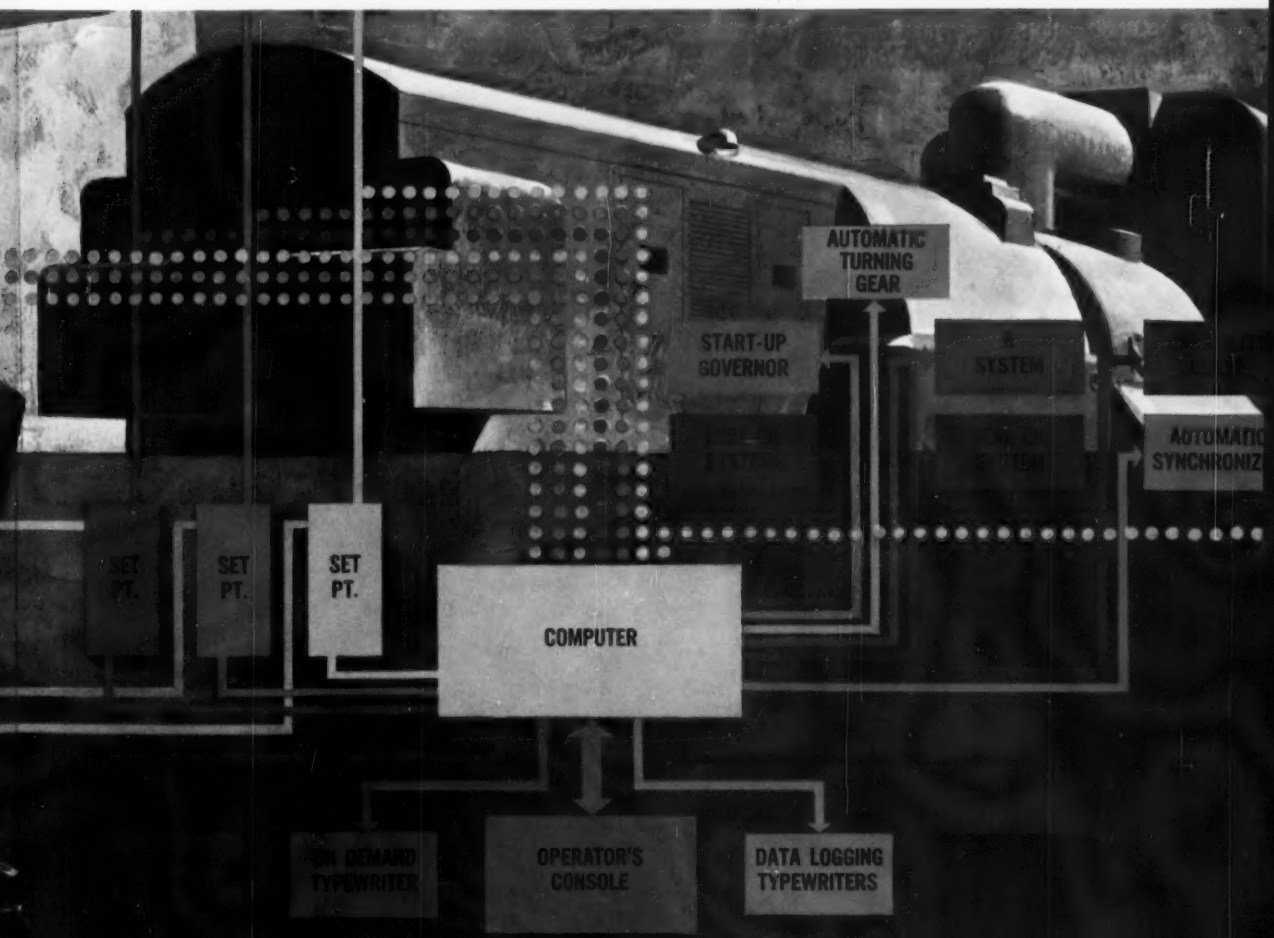
Westinghouse Powercasting can help you plan your system's future

Today, some utilities are faced with the immediate prospect of purchasing an automatic plant. You may be one of them. Whether or not you can make a decision now or any time may depend heavily upon the predictive and planning techniques available to you.

Westinghouse has developed a fundamentally new technique of total system planning . . . Powercasting. With the growing complexity of today's utility system, conventional planning methods just won't provide the answers fully or precisely enough. Therefore, Powercasting offers you a new way to create a plan, together with total capital investment needs, projected for the next 20 years.

*A Service-Mark of Westinghouse
†Trade-Mark

Westinghouse



Public Service with Westinghouse to automate its largest generating unit

Electric utility seeks today's ultimate in reliability—Westinghouse will engineer, furnish and coordinate the computer for automatic control on the Sewaren Generating Station Unit No. 5 for Public Service Electric and Gas Company of New Jersey. On-line target date —early 1962. On order—a 342,000-kw cross-compound turbine-generator and the new Prodac computer-control system.

This new unit will be more reliable than any conventionally controlled plant. Computer-control will provide greater reliability because it permits careful pre-programming of all normal and emergency operating procedures—precise, rapid supervision of incoming signals from hundreds of sensitive detectors—nearly instantaneous, multiple control of all critical power plant apparatus—anticipation and prediction of critical events before they occur, in time for corrective action.

The Westinghouse Prodac to be installed is the first industrial process computer-control using the unique new priority director to simplify the program, increase the operating speed and more efficiently utilize the memory capacity.

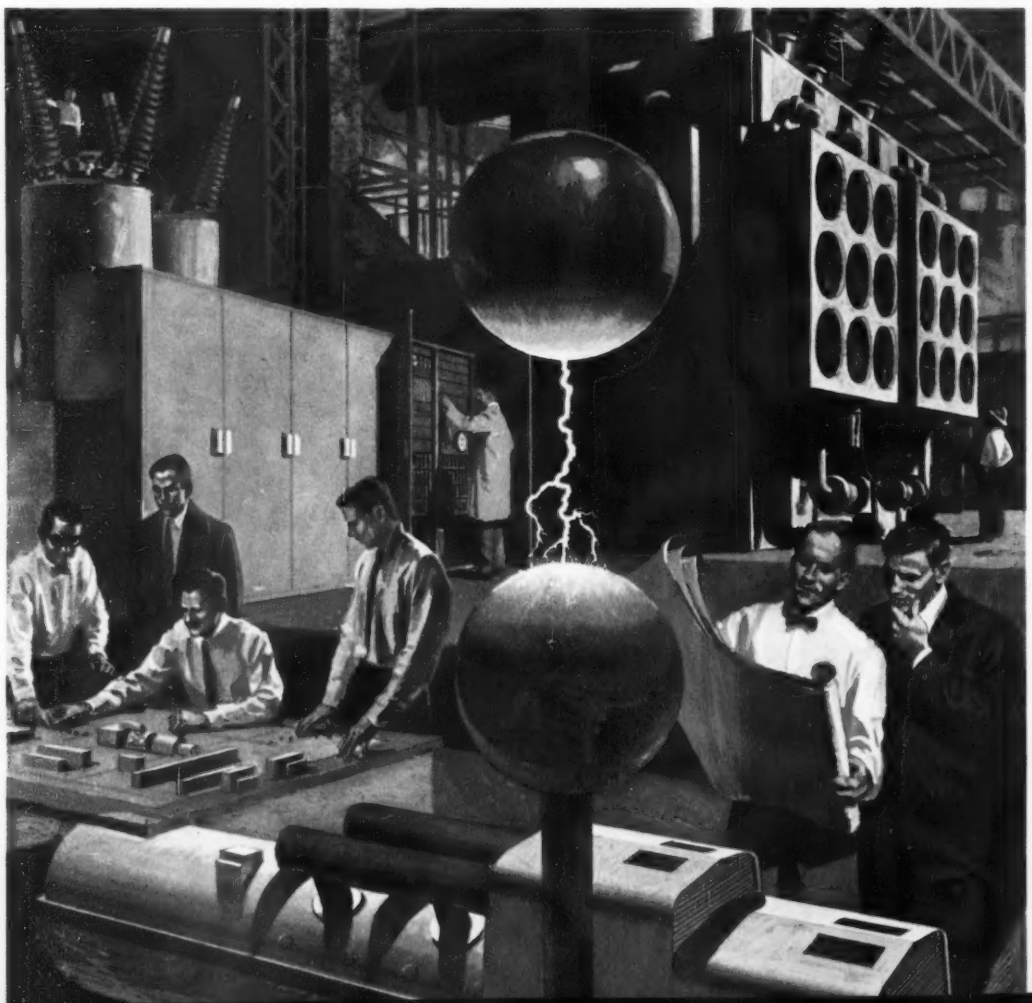
Westinghouse experience in the special problems and objectives of the electric utility industry is broad and deep. The men in Westinghouse, having this important experience capability, will use the most advanced analytical engineering and research facilities to help Public Service be certain that all aspects of this important project have been properly coordinated.

You can be sure . . . if it's Westinghouse.

Westinghouse

CP-1059

Litho in U.S.A.



Electrical World

OCTOBER 31, 1960

Vol. 154, No. 18

Preview of the Issue

DEPARTMENTS

Editorial Comment	45
What in the World	3
Letters	5
Dateline	5
Late News	24
Supply Lines	25
News Scope	51
EUM	60
Manufacturers News	64
New Equipment	72
Management Newsletter	81
Reference Sheet	85
Selling	89
News About People	92
Advertising Index	96

● **FIRST ANTITRUST TRIAL BEGINS today in Philadelphia, dealing with power switchgear assemblies. Trial should set pattern for future ones involving electrical manufacturing industry—Summary of all indictments** 46

● **ATOMIC POWER IS DELAYED by progress in making conventional steam power more economical, AIEE Chicago meeting hears. Steam power economy results from improved efficiency and lower coal costs** 52

● **220-KV LINE CROSSING DELAWARE RIVER is affected by navigation requirements. The 4,200-ft span's design takes into account proximity of airport and river traffic requirements** 56

CURRENT EVENTS

PRODUCTION OF 750 MW FROM PUMPED STORAGE is foreseen in two proposed projects near the Delaware Water Gap. One will link with three-state interconnection while larger project will supplement northern Jersey water supply 48

"IMPROPER INFLUENCE" is charged by Nez Perce men against FPC staff as controversy continues. Series of motions to strike testimony must be approved by presiding examiner to become effective 49

WEATHER BALLOONS FILL THE SKY signalling successful National Emergency Alarm Repeater test. Each balloon indicates a NEAR unit in a home has emitted a test alarm which would mobilize residents in case of an attack 50

DATELINE

COLUMBIA RIVER NEGOTIATIONS have two significant byproducts: US government departed from customary refusal to pay others for upstream improvements; inequity of subsidizing federal projects by changing unrealistically low interest rates 5

ELECTRIC UTILITY METHODS

CANOPY-SCAFFOLD PROTECTS WORKMEN from falling pieces of slag . . . Supporting sump pump on legs avoids clogging by silt and gravel 60

ENGINEERING REFERENCE SHEET

SPORTS AREA LIGHTING mounting-height chart describes proper elevation for floodlights for ground and aerial sports 85

MANAGEMENT

WHAT'S HAPPENING TO UTILITY EXECUTIVE SALARIES? Recent survey shows they are still getting closer to those for other industries but not as fast as in 1958 81

PURCHASING: Utilities relatively safe from Robinson-Patman Act . . . Meter indictment handed down . . . ICC continues freight reductions 25

MANUFACTURERS NEWS

SULPHUR-HEXAFLUORIDE INSULATES oilless high-voltage breaker and capacitors . . . Integrated automation will control French steam plant 64

POLITICAL

BREAKING WITH IKE'S POLICY, Nixon pledges to maintain 2% interest rate on federal loans for rural electric and telephone co-ops 88

SELLING

GAS LEADS in many household chores in race to become "fuel of the future," American Gas Assn convention is told. But speaker feels that exceptional promotion is needed to put over gas air conditioning and refrigeration 89

LATE NEWS ▶ **Electric generating facilities in connection with the Hanford, Wash.,** New Plutonium Production Reactor (NPR) have received the blessing of R. W. Beck & Associates in a report for the Joint Committee on Atomic Energy. This is the fourth major NPR review in less than three years. The Beck report says the economic analysis on which convertibility features were authorized by Congress in August, 1958, is still valid. More details on the report will be carried next week.

Four electric utilities have won Financial World "Oscar-of-Industry" trophies for outstanding 1959 annual reports. They are: Rochester Gas & Electric Corp, Silver Oscar, best of largest electric utilities; American Electric Power Corp, Bronze Oscar, best of public utility holding companies; Indianapolis Power & Light Co, Bronze Oscar, best of large electric utilities, and Shawinigan Water & Power Co, Bronze Oscar, best of non-domestic public utilities.

The electric consumer was referred to as "the forgotten man in a proceeding of this kind" by Philip Sporn, president of American Electric Power Co, while he defended AEP's stand on taxation before the Securities & Exchange Commission. SEC wants AEP to cease calling accumulated taxes from accelerated amortization and liberalized depreciation "restricted earned surplus," as required by states.

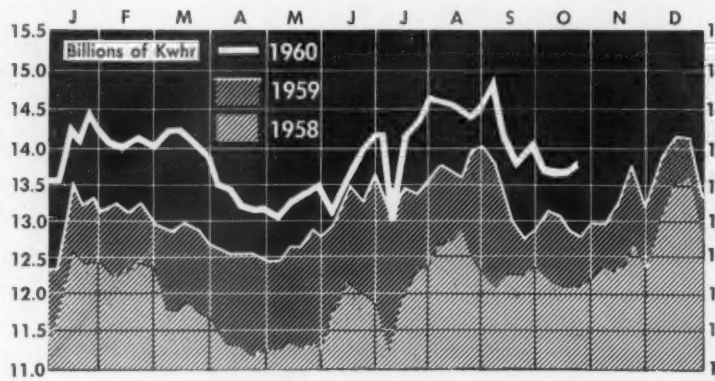
Arkansas PSC reaffirms utility's right to penalize customers for delinquent bill payments, but denies utility right to collect delinquent assessments on state and federal taxes involved in such bills. Case involved city of Fordyce, Ark., and Allied Telephone Co, which has been levying 10% penalty on late payments.

Japan Atomic Power Co, joint venture of nine utilities and Japan Electric Power Development Co eyes 200-Mw reactor, either pressurized water or advanced boiling water. Japanese AEC plans one million kw atomic capacity by 1970.

More detailed study of proposed Columbia River agreement by both public and investor-owned companies is needed to determine over-all benefits to area, according to Washington WP President George Brunzell. Priority construction of Canadian water storage projects might make some US projects uneconomical. He noted statement by Interior Undersecretary Elmer Bennett that there may be no immediate need for dams at either Nez Perce or High Mountain Sheep. Treaty announcement was praised by two area PUD's. Bureau of Reclamation spokesman said agreement brightens prospect for third power house, with eight 108-Mw units, at Grand Coulee.

Obituary: Harold Turner, 58, executive, American Electric Power Service.

WEEKLY POWER OUTPUT—Up 8.2% (Week ending Oct. 22), Kwhr 13,805,000,000



Per Cent Change From Previous Year

	Oct. 8	Oct. 15	Oct. 22
Total U. S.	+ 4.9	+ 6.9	+ 8.2
New Eng.	+ 2.4	+ 3.0	+ 4.4
Mid. Atlan....	− 1.3	+ 4.1	+ 5.8
Cent. Indust...	+ 5.2	+ 6.8	+ 7.8
West Cent. ...	+ 7.8	+ 8.1	+10.2
Southeast	+ 2.8	+ 4.7	+ 9.3
South Cent. ...	+ 7.7	+ 9.8	+10.6
Rocky Mount...	+17.2	+14.9	+ 9.5
Pacific			
NW	+ 5.0	+11.3	+ 6.5
SW	+11.9	+ 8.2	+ 9.6

Seasonally Adjusted Index 271.9
Week Ago 269.7 Year Ago 252.3

Source: Edison Electric Institute

Supply Lines

UTILITY BUYERS RELATIVELY SAFE FROM ROBINSON-PATMAN

Chances are remote for prosecuting any utility purchasing man under the Robinson-Patman Act. This is the law that prohibits either the receiving or the granting of special prices concessions on the sale of products or commodities when such price cutting tends to lessen competition in the marketplace. Because of the campaign which the Federal Trade Commission Chairman is waging in enforcing the Act, and because of his frequent appearances before purchasing groups to explain the Act, *Supply Lines* went to FTC sources for an appraisal of how the law might affect utility buyers.

FTC staffers think the Commission would hesitate to move in on utility purchasing men. For precedent, they note that no such action under Robinson-Patman has been taken. They also point to what they believe are two basic reasons for not taking on utility purchasing men:

- One involves the difficulty of showing injury to competitors.
- The other involves jurisdictional respect between federal agencies.

FTC lawyers like to pin down a price discrimination case showing both primary and secondary injury to competition. Primary injury is injury to the seller's competitors; secondary injury is to the buyer's competitors. It might be difficult to prove secondary injury satisfactorily in a proceeding involving a utility, mainly because products bought by a utility are not for resale. At the very least, showing injury to a utility's competitor would get into some very complex cost accounting, which FTC tries to avoid whenever it can.

Second, FTC would hesitate to tread into an area overseen by the Federal Power Commission. One section of the Clayton Antitrust Act does specifically exempt utilities and the feeling seems to be that FTC has enough work in areas where there is no doubt of its jurisdiction without going into investigations of utility buying.

Summing up: A utility purchasing agent could theoretically violate Robinson-Patman Act by inducing discriminatory prices from suppliers. But the FTC has never taken any action against utilities under the Act, and there seems to be no enthusiasm among FTC staffers to take on the utilities.

WATTHOUR METER INDICTMENT BELIEVED LAST IN SERIES

In what is believed to be the last in a long series of antitrust indictments against electrical equipment manufacturers, a Philadelphia Grand Jury early this month indicted three of the four large manufacturers of watthour and demand meters. Named in the most recent indictment were General Electric Co, Westinghouse Electric Corp, and Sangamo Electric Co. According to the indictment, a 6% price increase for watthour and demand meters was discussed and agreed upon in a Boston Hotel in January 1956. The indictment also charges that on four other occasions (April 1957, Nov. 1957, Aug. 1958, and Nov. 1958) representatives of Sangamo, GE, and Westinghouse met and agreed on additional prices increases, all of which were put into effect.

As the first of the trials got underway in Philadelphia (p 46), at least one Grand Jury was reported still working on fringe areas of the investigation. However,

observers say that the watthour and demand meter indictment was the last of the strictly electrical items.

GE STRIKE HAS LITTLE EFFECT ON UTILITIES

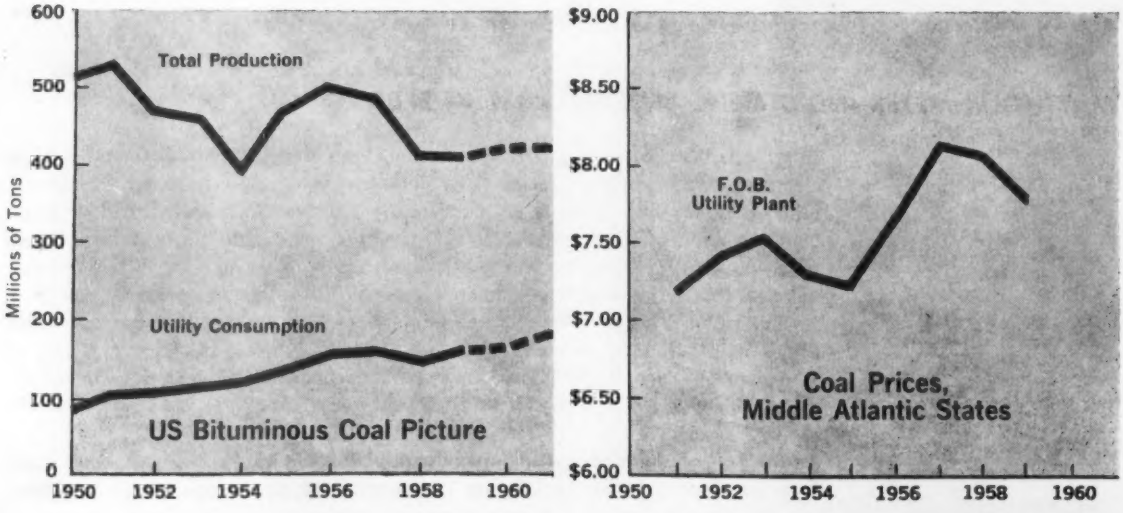
Utility buyers suffered little or no inconvenience from the three-week strike of some 50,000 workers at General Electric Co plants. Checks with a number of large utilities just before the strike ended showed that all were getting the products and material they needed with no delays. None had taken any extraordinary precaution before the strike and the general feeling expressed was that all but the custom-made equipment was available either from GE stocks or from other suppliers.

Terms of the strike settlement were almost identical with the original offer of GE. The offer deleted the cost-of-living quarterly wage adjustment provision which had been in the previous five-year contract. The company said the so-called "escalator clause" was inflationary. Westinghouse Electric Corp had settled two days earlier on roughly the same terms and with no work stoppage.

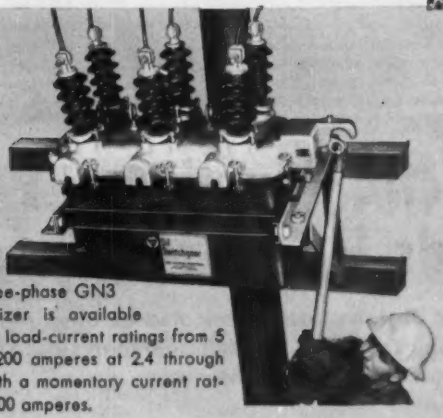
FREIGHT REDUCTION ON COAL IS CONTINUED

East Coast electric utilities will retain the advantages of reduced coal freight rates which have been in effect since early last year. Approval for the rates came earlier this month when the Interstate Commerce Commission acted to make the rates permanent. Barring a court reversal, the freight rates giving a 50¢ a ton freight reduction on shipments above the 1958 levels will continue.

Charts below show relative take of utilities, and prices per ton for the middle Atlantic states. The freight reduction is believed to account for about four cents of the 29¢ reduction in average coal cost to utilities during 1959. Most of the downward trend in that year is accounted for by a 25¢ per ton reduction made by suppliers at the same time the freight cut was put into effect.



Puget Power Installs GN3 Sectionalizers For Automatic Protection Of 12.5 kv Line



L-M's three-phase GN3 Sectionalizer is available in twelve load-current ratings from 5 through 200 amperes at 2.4 through 15 kv, with a momentary current rating to 9000 amperes.

GN3 Sectionalizers have simplified the coordination of Puget Sound Power & Light Company's 12.5 kv distribution line. With the GN3 permanent faults are isolated and maximum service continuity is maintained.

Puget Sound Power & Light Company has simplified coordination of its 12.5 kv distribution lines by utilizing L-M's new 3-phase GN3 Sectionalizers. Now when permanent faults occur, they can be isolated and maximum service continuity will be maintained.

In some cases, in order to utilize the counting feature of the GN3, oil circuit breakers were replaced with faster operating L-M reclosers. Faulted lines are isolated by this GN3 sectionalizer after three operations of the back-up recloser or station breaker.

L-M's 3-phase GN3 is a self-contained heavy-duty sectionalizer. The GN3 operates only when the back-up recloser is open; therefore it interrupts no current. It may be set to lock out after one, two, or three operations of the back-up recloser.

Get Complete Information

Contact your L-M Field Engineer and learn how simply the GN3 can be installed on your line; or write for Bulletin CR6. Line Material Industries, Milwaukee 1, Wisconsin. In Canada: CLM Industries, McGraw-Edison (Canada) Limited, Toronto 13, Canada.

EW1031

Line Material Industries
Milwaukee 1, Wisconsin

☐ Please send me Bulletin CR6 on the GN3 Sectionalizer.
☐ Please have L-M Field Engineer contact me.

Name_____

Title_____

Company_____

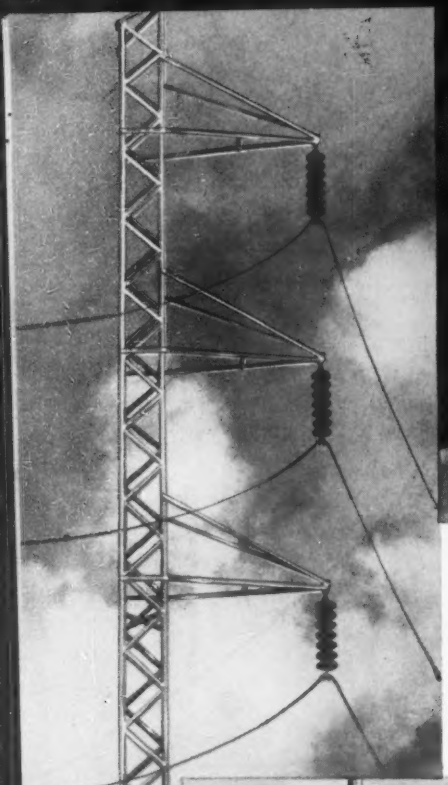
Address_____

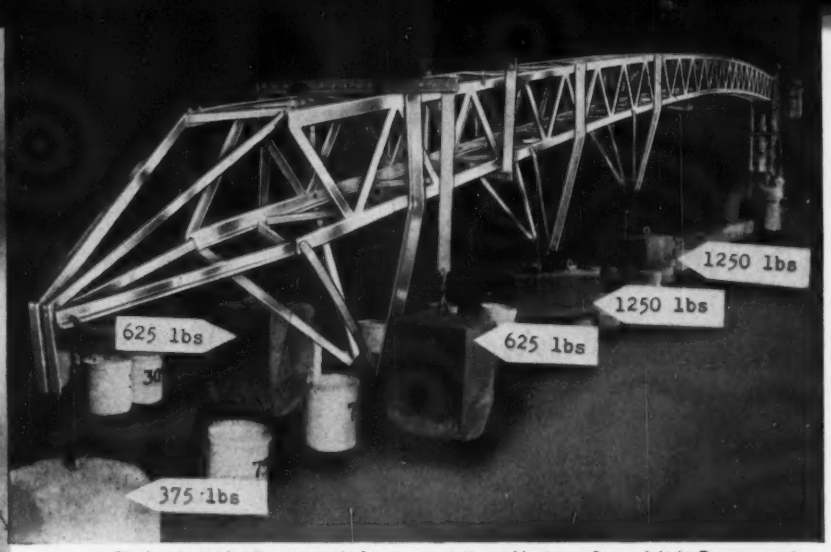
City & Zone_____ State_____

LINE MATERIAL® Industries
McGRAW-EDISON COMPANY
Reclosers, Sectionalizers, and Oil Switches

482

DISTRIBUTION TRANSFORMERS • RECLOSERS, SECTIONALIZERS AND OIL SWITCHES
FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT





Simulated wind loading test made for representatives of Louisiana Power & Light Company and other utilities. Four tests were made, simulating winds of 80, 110, 125, and 140 miles per hour, with dynamometer loading to represent weight and pull of insulators, three conductors, and static wire. These tests showed the power company engineers that this light-weight, low-cost transmission pole had strength well in excess of NEMA requirements.

L-M Alrectic Aluminum Pole Withstands Hurricane Forces

Alrectic structures designed and fabricated as aluminum, not aluminum replacing steel. Up to 80% lighter than steel and 30% lighter than other aluminum structures.

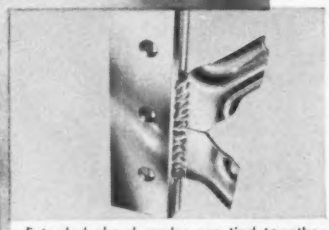
L-M's new Alrectic all-aluminum welded lattice poles provide high strength, safety, ease of installation because of their light weight; freedom from corrosion and maintenance; greater safety; and at an installed cost competitive with steel. These and other aluminum structures are made for Line Material by the Alrectic Division, recently acquired by McGraw-Edison Company from the Handley-Brown Company.

Poles are available for voltages up to 230 kv, in heights to 110 feet. Their appearance and ease of erection make them extremely desirable for transmission or distribution lines in congested business and residential areas where right-of-way, ground clearance, and appearance are problems.

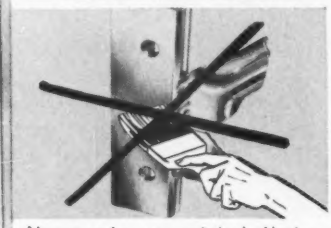
No guys are needed, except at angles and dead-ends. Poles are shipped completely assembled, or may be shipped in sections ready for bolting together. Bolts are needed only to mount tower to base and to attach crossarms to pole (except when poles are ordered shipped in sections).

While the poles do not taper in size, they do "taper" in weight, by reduction in size and weight of the extruded aluminum chord sections toward the top.

Costs of Alrectic poles are extremely moderate. Costs vary with height, strength factor, and loading. For example, an 85-foot pole costs from $1100 to $1400, depending on customer's loading requirements. Installation costs are so much lower that the installed cost is very close to that of steel—on top of which there is no painting, practically no maintenance.



Extruded chord angles are tied together by welded lacing members. Exclusive Alrectic method reduces heat-affected area, retains maximum temper in the aluminum. Combination lap and butt weld provides a joint that is stronger than any individual member. Slippage that can occur with bolted construction is eliminated.



No corrosion, no painting! Aluminum eliminates corrosion and the high cost of painting. Smooth aluminum finish eliminates cutting of shoes, belts, and gloves.

This high strength welded aluminum 85-foot lattice pole weighs only 1400 pounds; needs no painting; provides extra safety, easier installation; meets all AIEE and NEMA specifications.

HERE ARE DETAILS

Get Production Information and Technical Bulletin describing the tests made for a well-known power company. Ask the L-M Field Engineer; or write Line Material Industries, Milwaukee 1, Wis., exclusive distributor of Alrectic poles.

LM

LINE MATERIAL® Industries

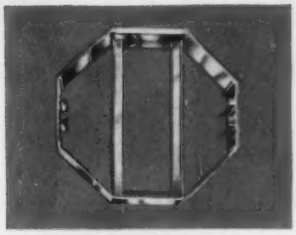
McGRAW-EDISON COMPANY

487

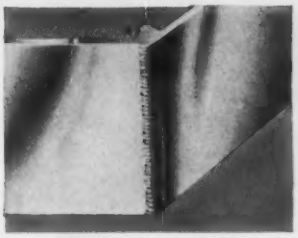
Alrectic Aluminum Structures

McGRAW EDISON

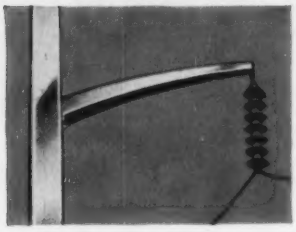
DISTRIBUTION TRANSFORMERS · RECLOSERS, SECTIONALIZERS AND OIL SWITCHES
FUSE CUTOUTS AND FUSE LINKS · LIGHTNING ARRESTERS · POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS · CAPACITORS · REGULATORS · OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS · PORCELAIN INSULATORS · FIBRE PIPE AND CONDUIT



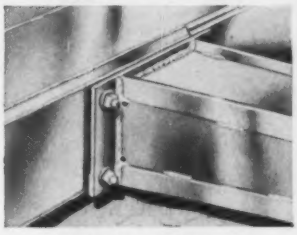
Cross section of pole, showing internal bracing welded at critical loading points.



Bulb strengthens member, conducts heat away from the combination butt and lap weld.



Crossarms are strong, graceful in appearance.



Crossarms are bolted to Alrectic poles at the job site.

L-M's New Tapered Octagonal Alrectic Aluminum Pole Easily Meets Severe Wind-Load Tests

L-M's handsome new octagonal all-aluminum pole is outstanding. The 85-foot pole with 2-foot base weighs only 2400 pounds with crossarms. Excellent appearance builds community good-will; high strength, smooth finish improve safety. All-Aluminum construction eliminates corrosion, painting.

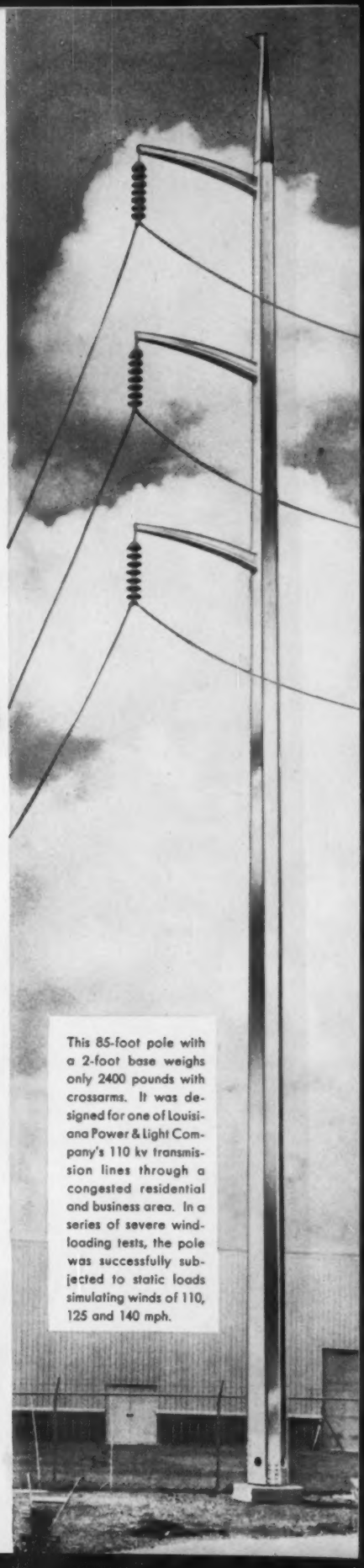
In a series of severe wind-loading tests recently conducted before power company engineers, the pole was subjected to static loads simulating winds of 110, 125, and 140 miles per hour. The pole had ample strength to meet these severe requirements.

These poles are fabricated of extruded aluminum chords, welded throughout their entire length. Internal stiffener plates welded inside opposing chords provide added strength in the transverse loading direction. The welding provides great strength and rigidity, and eliminates the slippage that often occurs with bolted construction. Detachable pole steps are available.

The bending moment of Alrectic poles makes spans of 600 feet practicable, compared to 175 feet for wood poles. This reduces the number of poles and makes it easier to get right-of-way approvals. Poles are available for up to 230 kv in any height to 110 feet. Cost of the poles themselves is moderate. For example, an 85-foot pole costs from $2100 to $2300 depending on strength required. Actual costs depend on loading requirements, height, and strength factors; and installation costs are low, making the total cost moderate.

Get Details, Technical Bulletin on Tests

Ask the L-M Field Engineer to give you complete information and test data on these handsome, high-strength, low-cost poles. Or write Line Material Industries, Milwaukee 1, Wisconsin, exclusive distributor for the poles made by the Alrectic Division of McGraw-Edison Company.



This 85-foot pole with a 2-foot base weighs only 2400 pounds with crossarms. It was designed for one of Louisiana Power & Light Company's 110 kv transmission lines through a congested residential and business area. In a series of severe wind-loading tests, the pole was successfully subjected to static loads simulating winds of 110, 125 and 140 mph.

LINE MATERIAL® Industries

McGRAW-EDISON COMPANY

Alrectic Aluminum Structures

488

DISTRIBUTION TRANSFORMERS · RECLOSERS, SECTIONALIZERS AND OIL SWITCHES
FUSE CUTOUTS AND FUSE LINKS · LIGHTNING ARRESTERS · POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS · CAPACITORS · REGULATORS · OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS · PORCELAIN INSULATORS · FIBRE PIPE AND CONDUIT

THIS MIND IS ABSORBED IN YOUR POWER PLANT'S FUTURE

Our headline might well read "Mind at Work"—for this Ebasco engineer is constructing, in his mind, a power plant to meet a specific need. And behind this creative engineering approach are years of experience in serving the electric power industry—from design and construction of distribution and transmission systems to complete handling of new generating plant installations.

The Ebasco mind is trained to think a project through, from concept to completion. It looks to the future—and draws on the past. And Ebasco's standard of quality shows in every power plant it engineers and constructs.

Ebasco flexibility permits tailoring of contractual conditions to individual requirements.

Our brochures describe Ebasco's services and how they may be of use to you. For copies, write Ebasco Services Incorporated, Dept. M, Two Rector Street,

ENGINEERS · CONSTRUCTORS · EBASCO · MANAGEMENT CONSULTANTS

NEW YORK
CHICAGO
DALLAS
PORTLAND, ORE.
SAN FRANCISCO
WASHINGTON, D. C.

There's no wear here

Notice how the conductor clears the clamp end with plenty of room for movement? There are no sharp edges to chew into it, shortening service life. This is just one of many features designed into O-B Strateline clamps. Others are:

KEEPER-PIECE permanently attached to U-bolts simplifies installation and hot line working.

LONG U-BOLTS that permit positioning the conductor under the keeper piece without taking off the nuts.

ADEQUATE HOLDING POWER for normal distribution requirements.

NUTS AND U-BOLT ENDS ROUNDED to impede corona.

SLENDER DESIGN makes it easy to cover clamp with rubber goods.

BROAD SELECTION OF CLAMP SIZES from .15-inch to 1.55-inch conductor diameters.

O-B Stratelines are made in a choice of aluminum, malleable iron, or bronze so that you can have the clamp you want for the type of conductor to be used.

O-B has designed into this clamp the extra features you need for convenient, dependable deadends. Why not order O-B Strateline clamps for your next distribution deadend construction!

OHIO BRASS COMPANY, MANSFIELD, OHIO
Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

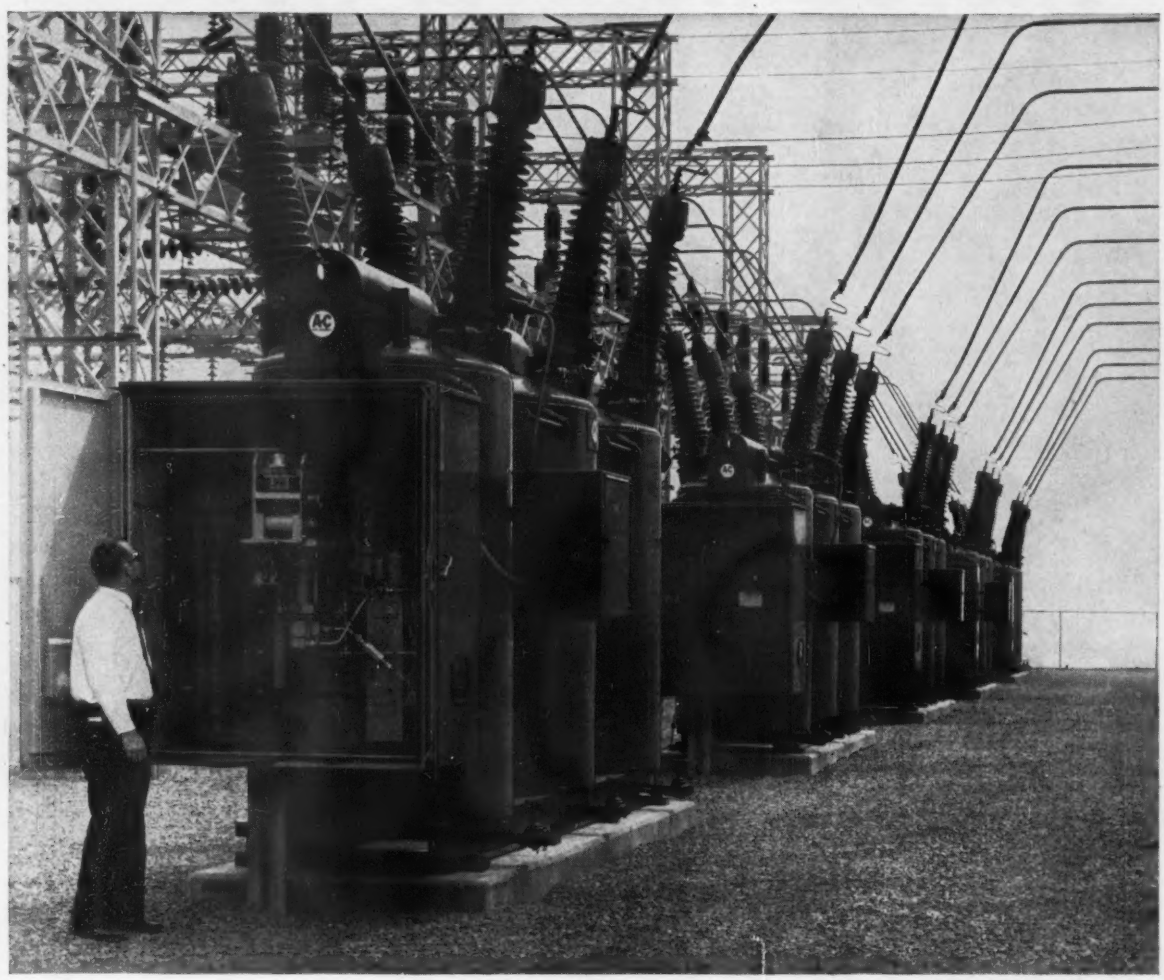
Distributed by GraybaR ELECTRIC COMPANY

Ohio Brass HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

10039-H

ALLIS-CHALMERS



Line-up of A-C breakers with **Pneu-Draulic** operators at Niagara Mohawk's Porter Station.

Our breaker customers know what they want:

98% demand Pneu-Draulic operators

High-speed interruption, consistent reliability and low maintenance costs —these account for the decisive preference for A-C circuit breakers with *Pneu-Draulic* operators. In 6 years since their introduction, *Pneu-Draulic* operators have won acceptance of 160 companies. Over half our sales are repeat orders.

Preferred advantages include safe closing of breaker at full rated speed onto energized line, even when no control power is available, thanks to reliable stored-energy mechanism. Design is climateproof... oil instead of air eliminates need for anti-freeze solutions and rules out moisture and corrosion problems.

Get the facts on *Pneu-Draulic* operators — available on all Allis-Chalmers outdoor breakers rated 14.4 to 345 kv, 500 to 25,000 mva.

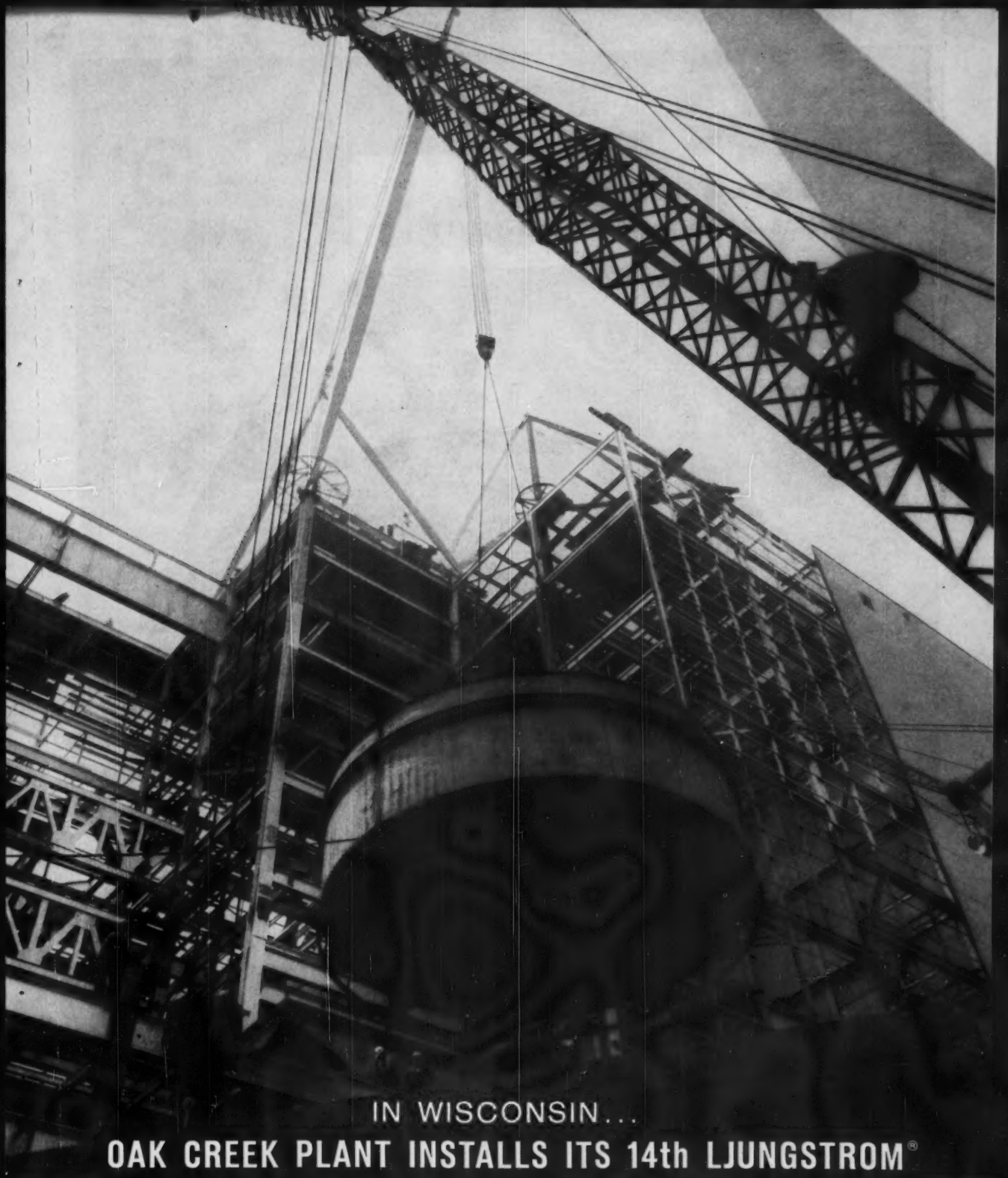
Call your nearby A-C office or write ***Allis-Chalmers,*** *Power Equipment Division, Milwaukee 1, Wisconsin.*

Compare these advantages —

- Compact size, with few moving parts.
- Protected against rust, freezing and corrosion.
- Automatic emergency closing at full rated speed even without control power.
- Complete system protection with mechanically trip-free operator.

Pneu-Draulic is an Allis-Chalmers trademark.

A-1305



IN WISCONSIN...

OAK CREEK PLANT INSTALLS ITS 14th LJUNGSTROM®

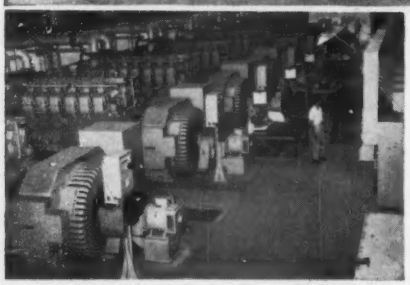
Three new Ljungstrom Air Preheaters are being added to the eleven already in service at Wisconsin Electric Power Company's Oak Creek plant. These three 290-ton units will serve the 1,780,000 lb/hr boiler on Oak Creek's #6 unit. The three Ljungstroms, with a total heating surface of 795,300 sq ft, will reduce stack gas temperature from 550°F to about 270°F and preheat incoming combustion air from 190°F to about 510°F.

Our engineers will be glad to recommend how Air Preheater equipment can improve your operating results on new or existing fuel fired units.

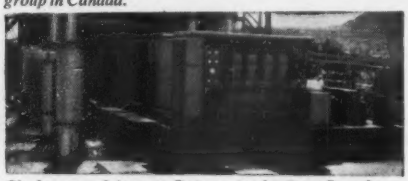
THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

DIESELS AID NEW RECLAMATION PROJECT



Power for Bangkok. *Eight of ten* 'ENGLISH ELECTRIC' *1501 h.p. diesel engines driving 1058 kW alternators at Lumpini Park Generating Station. The alternators for these sets were built by the* 'ENGLISH ELECTRIC' *group in Canada.*



Slush pump drives at Qatar. *At the Iraq Petroleum Company's oilfields, two* 'ENGLISH ELECTRIC' *525 b.h.p. dual-fuel engines drive the slush pumps and at the same site three identical engines power the largest drilling rig in the Middle East.*

HOW TEN DIESEL ENGINES ARE HELPING TO BRING GREATER PROSPERITY TO THE SOUTH-WEST

At Glen Canyon, a 700 foot deep gorge in sunbaked Northern Arizona, another great dam is now under construction, the prelude to further control and utilization of the precious water of the Colorado River. The dam is being constructed by the Bureau of Reclamation, with Merritt-Chapman and Scott Corporation as prime contractors.

Part of the power to build this dam is provided by ten 'ENGLISH ELECTRIC' 1103 kW diesel alternator sets.

The reliability of these 'ENGLISH ELECTRIC' diesel engines has been demonstrated by their increasing use in all parts of the world for electrical power generation, for traction, marine propulsion and auxiliary power, as well as for pumping and oil drilling.

The range of 52 engines is developed from eleven basic types, using only two cylinder sizes, which greatly simplifies maintenance and spares stocks.

Wherever power is used — or needed — 'ENGLISH ELECTRIC' factories in five continents and the worldwide network of agents and representatives keep all jobs within easy reach.

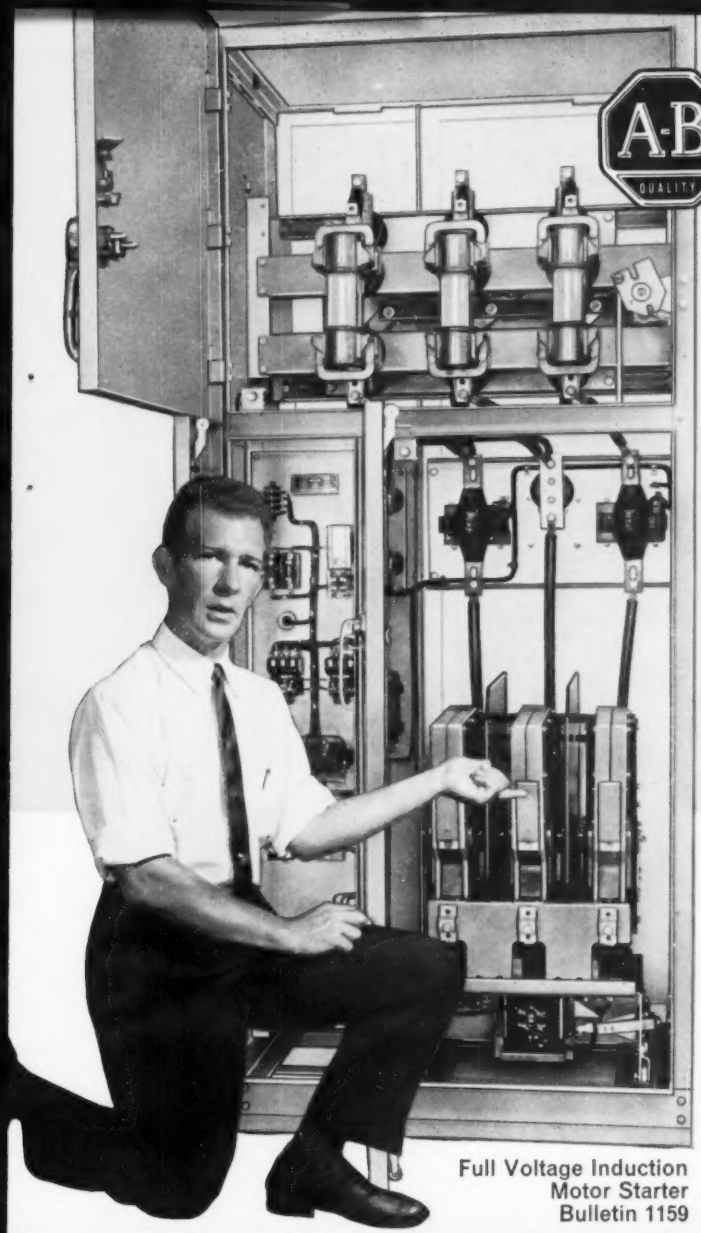
'ENGLISH ELECTRIC'

Agents: ENGLISH ELECTRIC EXPORT & TRADING CO. LTD., 750 THIRD AVENUE, NEW YORK 17, N.Y. Tel: MURRAY HILL 7-0303

Sub Agents:—

James I. Metcalf & Co. Inc.,	Room 704, 1411 Fourth Avenue, Seattle 1, Washington. Branch office in Portland, for Washington and Oregon.
Electron Equipment Co. Inc.,	2418, Calhoun Street, New Orleans, 18, Louisiana, for Louisiana and Mississippi.
Osgood & Associates, Inc.,	988, Spring Street, N.W., P.O. Box 7383, Station C, Atlanta, Georgia, for Georgia, Alabama, Tennessee and South Carolina.
Peabody Brothers.,	2903 St. Louis Street, at Oakland, Dallas 26, Texas. Branch offices in Houston and Tulsa, for Texas, Oklahoma, Arkansas and New Mexico.
Flagg, Brackett & Durgin, Inc.,	183 Essex Street, Boston 11, Massachusetts, for Massachusetts, Rhode Island, Maine, New Hampshire and Vermont.
Charles R. Lee & Associates, Inc.,	3796 West Flagler Street, Miami 44, Florida, for Southern Florida.

OC/US/8



Full Voltage Induction
Motor Starter
Bulletin 1159

The only
HIGH VOLTAGE STARTERS

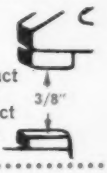
built to provide millions of trouble free operations

An astounding claim but true! The secret of this remarkable operating life of Allen-Bradley high voltage air break starters is found in the extremely short contact travel—*it's only 3/8"*. Thus, pounding and contact wear are reduced to a minimum. In addition, contactors in A-B high voltage starters have only ONE moving part. It's the same simple solenoid design that has proved good for millions of trouble free operations in A-B low voltage starters. And like A-B low voltage starters, the double break, silver alloy contacts never need maintenance. For complete details on Allen-Bradley high voltage starters, send for Publication 6080.

FEATURES OF THE ALLEN-BRADLEY RUGGED SOLENOID AIR BREAK CONTACTOR

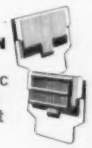
ONE MOVING PART
All trouble-causing pivots, pins, and flexible jumpers are eliminated.

CONTACT TRAVEL ONLY 3/8"
Reduced impact and pounding extends contact operating life.

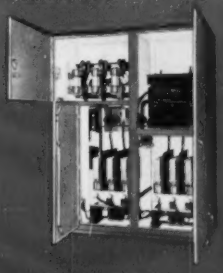


DOUBLE BREAK CONTACTS
of silver alloy completely eliminate the need for contact maintenance.

FAST ARC SUPPRESSION
New blowout design, new arc chutes molded of arc resistant material.

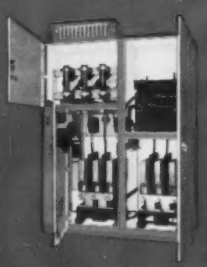


ALLEN-BRADLEY HIGH VOLTAGE STARTERS ARE MADE FOR ALL TYPES OF MOTORS AND ALL TYPES OF SERVICE

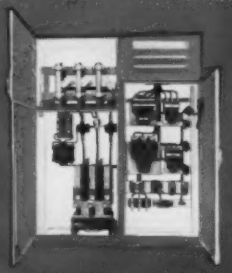


Reduced Voltage
Induction Motor Starter
Bulletin 1172

Full Voltage
Synchronous Motor Starter
Bulletin 966



Reduced Voltage
Synchronous Motor Starter
Bulletin 983



Wound Rotor Motor Starter
Bulletin 1180

ALLEN-BRADLEY

Member of NEMA

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. • In Canada: Allen-Bradley Canada Ltd., Galt, Ontario

QUALITY MOTOR CONTROL

18-60-M

ACTUAL TESTS* PROVE

Allen-Bradley Standard Duty Push Buttons can be installed

in about half the time!

In accurately timed tests, Allen-Bradley standard duty push buttons required *about half the installation time*—on the average—than each of four other popular makes. This saving in installation time means "dollars" saved on the job.

How come only famous A-B standard duty push buttons possess this time and moneysaving advantage?

The answer lies in the molded, wrap-around cover—which also contains the contacts. When the cover is removed, the wiring terminals are *out in the open*—ready for wiring—and you have plenty of working space. The two cover screws are captive—they cannot fall out and get lost. And with the contacts in the cover, they are protected against accidental damage and careless wiring. Naturally, these push buttons have double break, silver contacts that never need service attention. There are two concentric knockouts on each end of the base, which are removed from the *outside*—the heavy, pressed steel base will not bend out of shape.

Your local A-B distributor has these Bulletin 800 push buttons *in stock*. Call him today—you'll save time and money on your next job.

**Using recognized standard duty push buttons, installations were made by an experienced electrician under identical conditions. He was not connected with Allen-Bradley Company in any manner.*

A-B STANDARD DUTY PUSH BUTTONS
Made as a one-, two-, or three-unit station—with pilot light available. Readily changed for horizontal or vertical mounting. Convertible two- or three-way selector switch supplied with or without pilot light.

18-60-M

ALLEN-BRADLEY

Member of NEMA

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. • In Canada: Allen-Bradley Canada Ltd., Galt, Ontario

QUALITY MOTOR CONTROL

SILICONE NEWS from Dow Corning

No Flashover Here

Silicone Coating Prevents Power-Stealing Leakage

Mist, fog, salt spray and other moisture "beads" harmlessly on insulators coated with Dow Corning 5 Compound.

Dow Corning 5 Compound offers easy-to-apply, economical protection that prevents insulator damage, reduces service interruptions, and lowers insulator maintenance costs.

Here's how: Dust, dirt and other airborne contaminants that settle on insulators are quickly engulfed and completely encapsulated by water-repelling silicones. No power-stealing leakage paths can form.

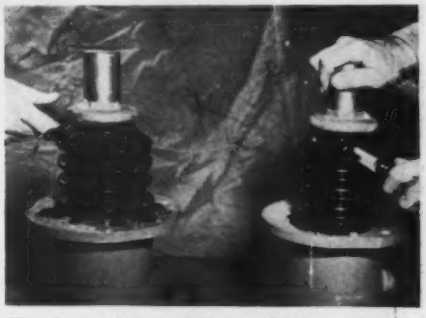
Dow Corning 5 Compound can be applied to insulators by hand, brush, or spray. It will not wash off, run off in hot weather or turn waxy in cold. A single application can remain effective up to five years and longer.

For all the facts on Dow Corning 5 Compound as an insulator coating, and how it reduces outages, flashover and maintenance, write Dept. 3110.

Reduce Cleaning Costs & Outages

The most stubborn contaminants are easily wiped off silicone treated insulators. Silicones make it unnecessary to use solvents, steel wool or wire brushes . . . or to remove insulators from their mounts for cleaning.

One Midwest utility formerly had to disassemble all the insulators of a 35.5-kv substation located near a cement plant three times a year for a thorough scrubbing with solvents and steel wool. Silicone treated, the same insulators are now merely wiped off with a dry rag every six months and 5 Compound reapplied . . at a small fraction of the previous cost in materials, labor, and outage time! Other utilities report similar savings.



Here's another use! Before filling potheads, coat the terminal bushings with Dow Corning 5 Compound. Any overflow of the filling material will strip easily from the pothead bushings. In contrast, overflow frequently must be chipped and scraped from untreated bushings.

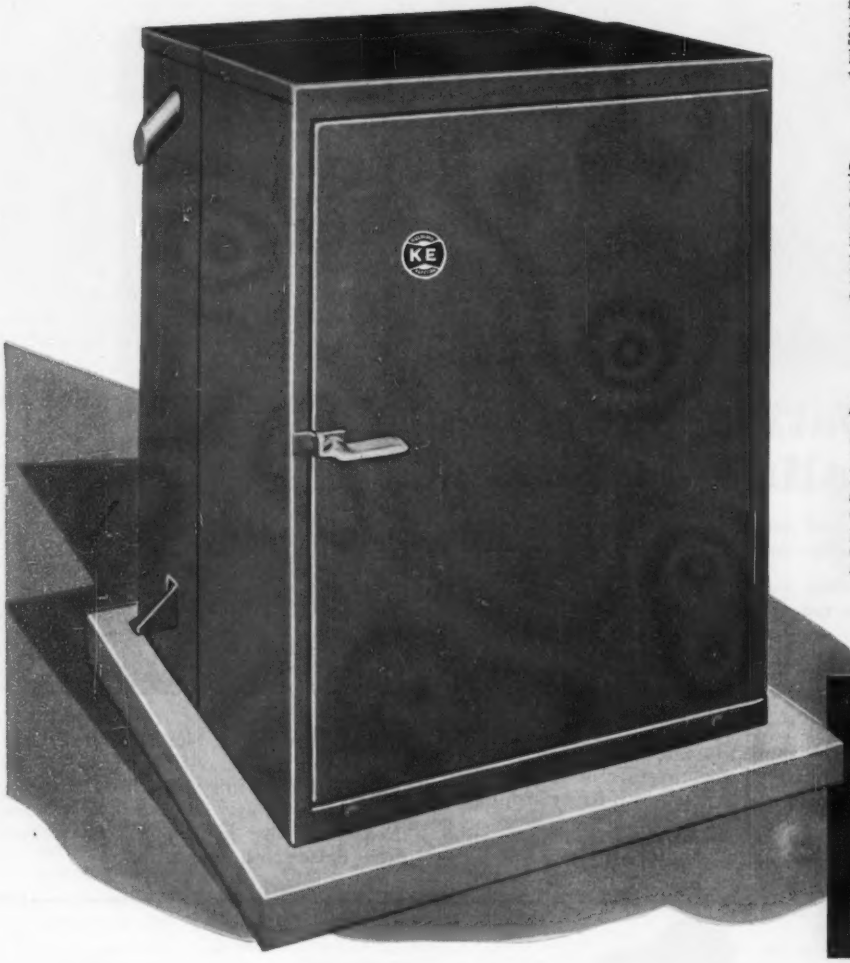
The nearest Dow Corning office is the number one source for information and technical service on silicones.

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

INTRODUCING . . .
PMT
THE PAD-MOUNTED TRANSFORMER
ONE CABINET SIZE FOR ALL



Check These Exclusive PMT Features:

3 Choice Sectionalizing Load Break Switch . . . Isolates trouble without dropping the primary feed. This means less outage time during transformer change-outs or faulted cable isolation. Three settings permit loop feeder service or service from 1 of 2 sources. See explanation below showing how the sectionalizing switch works.

Quick Change-Outs . . . Compartment design further simplifies change-outs. Uprating through 100 KVA is a matter of loosening four clips and replacing the transformer unit with a higher KVA rating. The same cable compartment serves all ratings.

Low Loss, Long Life Transformer Unit . . . The PMT Transformer unit includes the famous low-loss "Bent Iron" core and "Long Life" Kuhlman coil. It offers the same low exciting current—low copper and core loss—low impedance—better regulation and operating economy designed into all Kuhlman transformers.

Get all the facts about new Kuhlman PMT. Write for PMT bulletin, CS-205.

Advertising Department
Kuhlman Electric Company
P.O. Box 288
Birmingham, Michigan

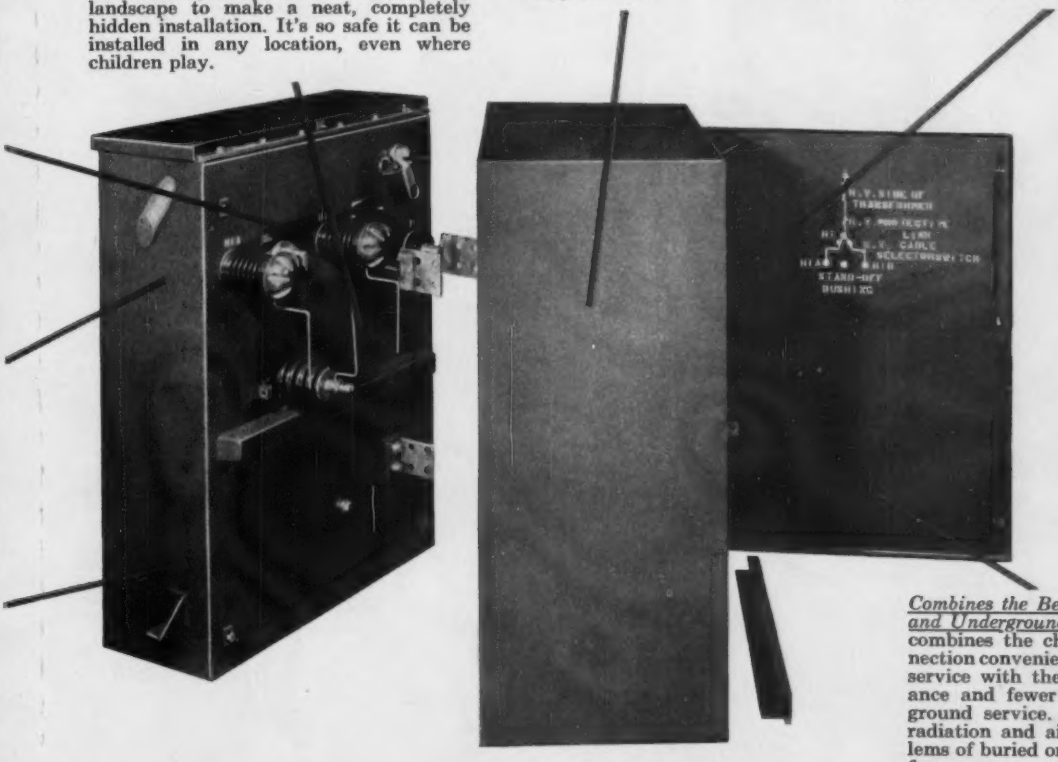
Economical, flexible, compact Kuhlman PMT meets all the special needs of underground distribution. It is easy to landscape—easy to change-out. It operates at full load capacity and is completely safe.

WITH A SECTIONALIZING SWITCH AND RATINGS THROUGH 100 KVA

Serves In Any Location . . . High and low voltage bushings are separated by insulation barriers. An insulating panel (not shown below) closes off the high voltage section protecting personnel from accidental contact with the high voltage. PMT readily blends into the surrounding landscape to make a neat, completely hidden installation. It's so safe it can be installed in any location, even where children play.

Compact and Convenient . . . Transformer terminals, incoming cables and protective equipment are easily accessible and conveniently located in a self-contained enclosure. Ample space is provided without sacrificing compactness.

Operates at Full Nameplate Capacity . . . PMT does not have to be derated. Mounted above ground, it takes full advantage of Kuhlman's generous oil circulation to assure cooler operation, longer life and greater short-time overload capacity.

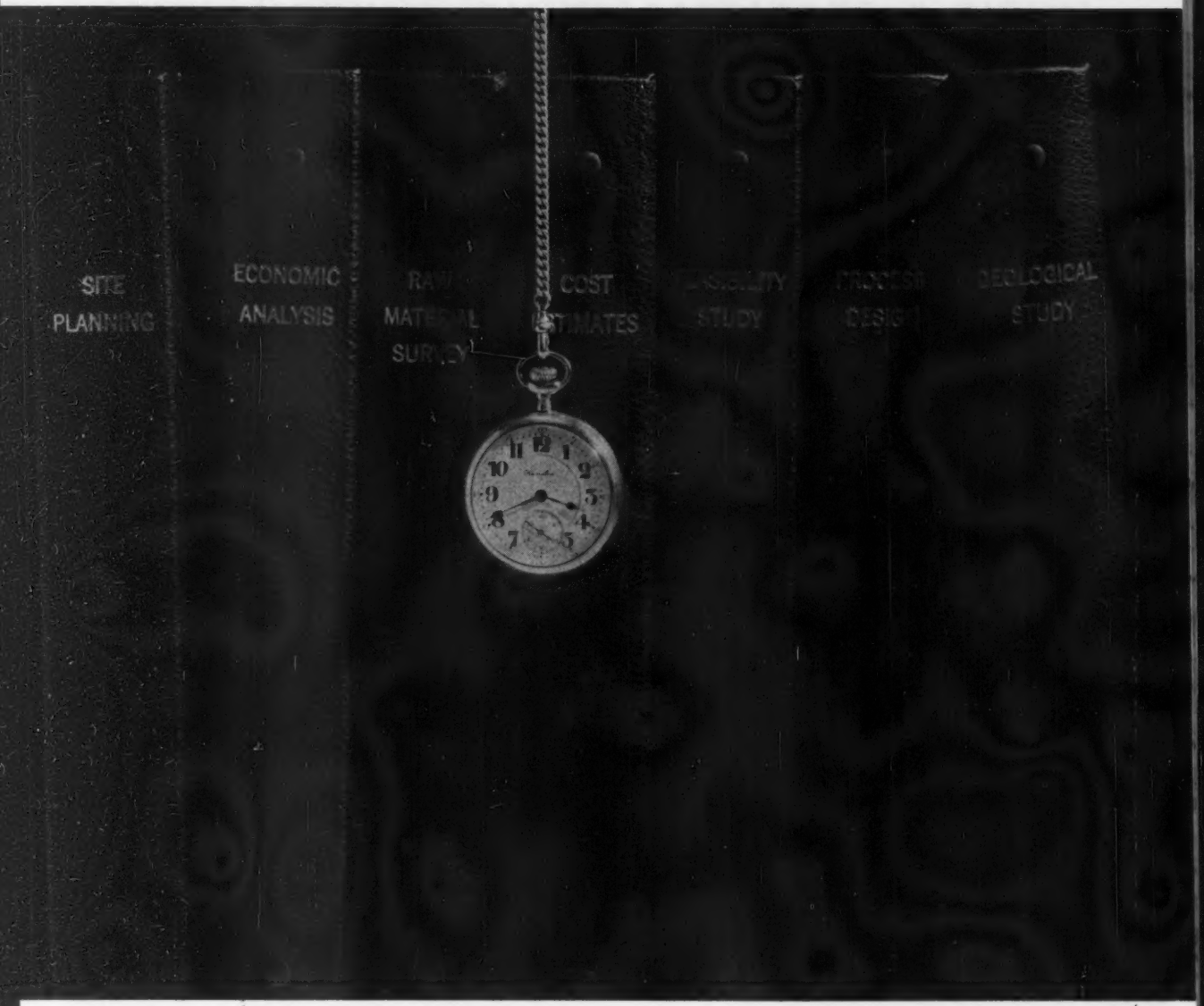


Combines the Best in Above Ground and Underground Service . . . PMT combines the change-out and connection convenience of above ground service with the improved appearance and fewer outages of underground service. It eliminates heat radiation and air circulation problems of buried or semi-buried transformers.

KUHLMAN TRANSFORMERS

KUHLMAN ELECTRIC COMPANY, Birmingham, Mich. **Factories at Bay City, Mich.; Crystal Springs, Miss.; Salinas, Calif.**

Pre-Engineering by **KAISER ENGINEERS** answers basic plant expansion questions...



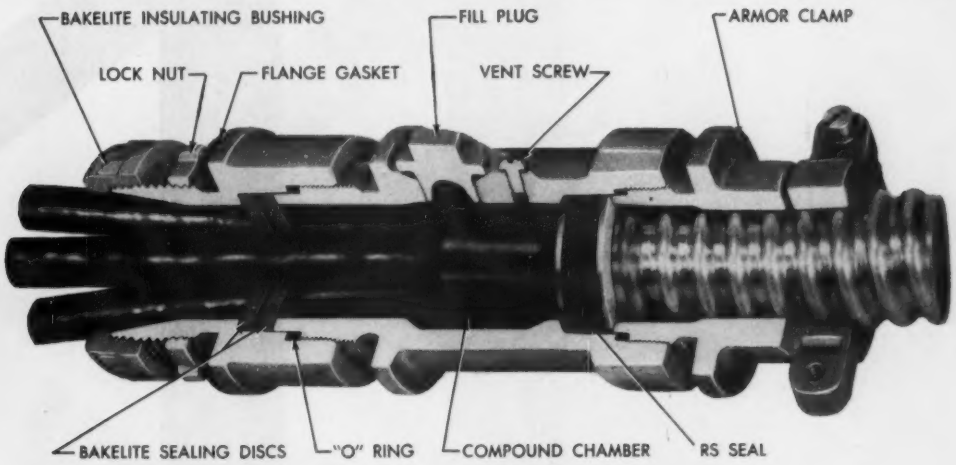
Timely? Many complex factors shape the final decision to proceed with your expansion plans...and timing is an important one. Independent analysis of all aspects of your proposed program is the *Pre-Engineering* service offered by Kaiser Engineers. The studies and evaluations furnished by KE Pre-Engineering represent only one phase of total KE services. Kaiser Engineers designs and builds all types of power plants—steam-electric, gas turbine, combined cycle, nuclear, and hydro-electric. From Pre-Engineering through design and construction, Kaiser Engineers provides complete, one-company service and ingenuity based on years of experience.

KAISER ENGINEERS **KAISER ENGINEERS** engineers-contractors
Contracting since 1914

Oakland 12, Calif. — Chicago, New York, Pittsburgh, Washington, D.C.
Accra, Buenos Aires, Montreal, New Delhi, Rio de Janeiro, Sydney, Vancouver, Zurich

6228-P

New from the only manufacturer of *all* cable accessories . . .



G&W Series 800 Interlocked Armor Cable Fittings

. . . accommodate all commercially available interlocked armor cable

. . . reduce installation time and effort

. . . available for immediate delivery

New G&W Series 800 Fittings not only terminate, but support, ground, mount, and dead end on the widest variety of applications. They offer simplified, modern design in only four basic pipe sizes to accommodate all interlocked armor cable now being manufactured. Eight different fittings in each size means faster installation from simple armor clamps to compound-filled terminations used in any position.

CHECK THESE SIGNIFICANT FEATURES:

- **High strength aluminum parts**
- **Resistoyl® gaskets**
- **RS seals proven on potheads, boxes, and switches**
- **Interchangeable components**
- **Water-tight construction**

G&W's Series 800 Fittings are an important addition to the only complete line of cable accessories available . . . G&W also offers the *best* engineering information service to assist you in any of the following areas:

Potheads . . . Terminating Kits . . .

Splice Kits and Boxes . . . Joints . . .

All high and low voltage Cable Accessories

Further proof that you save time and money by relying on the dependability of G&W's constant product development. For the detailed story on the new Series 800 Fittings, mail the coupon below for your copy of Catalog H.

H60-1

G&W ELECTRIC SPECIALTY COMPANY
3500 West 127th Street • Blue Island, Illinois

☐ Send me a copy of Catalog H detailing facts about the new G&W Series 800 Interlocked Armor Cable Fittings.

I specify interlocked armor cable for the following applications:

_____

_____

Name and Title: _____

Company: _____

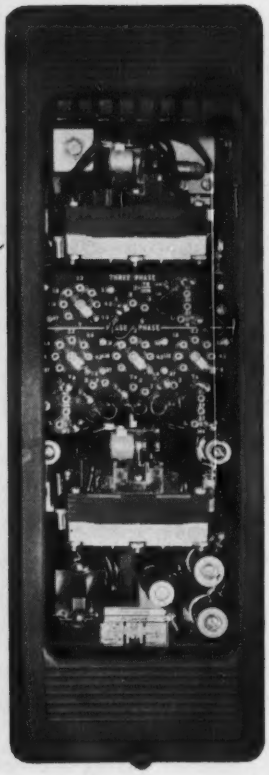
Address: _____

City: _____ Zone: _____ State: _____

superior quality standards
— inspired specialized designs

NEW

Westinghouse KD-CO relay system offers unmatched protection for subtransmission and distribution lines

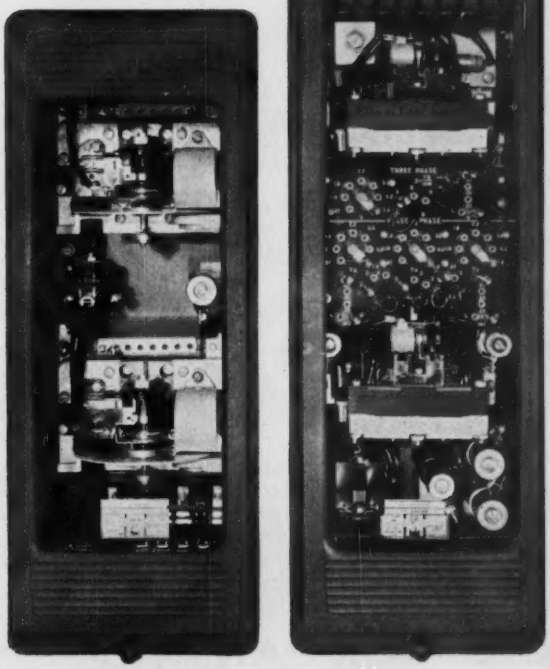


For the first time, this new Westinghouse relay system permits the exact fixing of the distance of overcurrent protection along the line and offers complete directional distance torque-control. Three standard Westinghouse Flexitest* cases enclose the whole scheme, neatly and compactly. You enjoy the assurance of dependable performance established by the famous semi-static K-Dar units. These are completely standard KD relays, used in conventional zone and carrier relay systems.

Call your Westinghouse sales engineer for more information about this new advance in protective relaying or write for RPL 60-14, Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. You can be sure . . . if it's Westinghouse. J-40534

*Trade-Mark

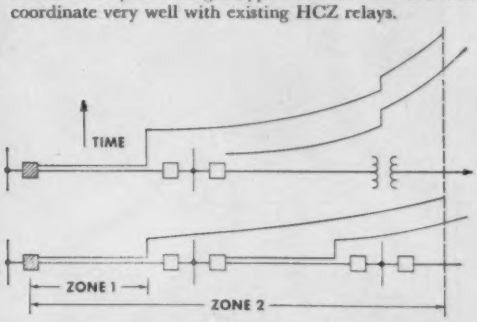
Two standard KD relay units and one two-unit CO timing relay comprise the complete package. Note how neatly and compactly they work together in standard Westinghouse Flexitest cases.



Here's how it works:

One KD is set for 90% of the line for instantaneous primary first zone protection. The other KD is set into or through the remote adjacent line for end zone primary and remote back-up protection. This KD is also used to torque-control the double-unit CO relay which is used as a timing relay for selective tripping. The overcurrent sensitivity can be set below load since its operation is controlled by the KD relay. The KD relays can be set into or through the transformer bank for full protection on either side of the bank.

It's worth noting, too, that various overcurrent time characteristics can be used to coordinate with existing relays . . . Types CO, CR, HRZ or HCZ. For example, the KD-CO system using a Type CO-7 characteristic will coordinate very well with existing HCZ relays.



Typical application for two-zone KD relaying with two-unit torque-controlled Type CO relay for zone-two timing.

Westinghouse

Developed by SANGAMO

to meet your power capacitor needs . . .

SELCOVAR 50s - 100s

EXTRA small in size
EXTRA light in weight
EXTRA low in watts loss

W. J. Thacker, Manager, Power Capacitors and Controls, displays Sangamo's newest contribution to the utility industry . . . SELCOVAR 50's and 100's.

The new Sangamo 100 kvar capacitor is 14 to 19 percent lighter—21 to 24 percent smaller than other 100 kvar capacitors on the market today. A new low-loss kraft paper dielectric combined with Sangamo design and manufacturing methods enables low losses, low dielectric temperature and exceptional stability.

Use of the same design advantages in the 50 kvar unit substantially reduces its weight and size, and results in a unit with 15 percent lower watts losses over an extended temperature range.

Pole type and stacking unit equipments are available with these new Selcovar 50 and 100 kvar capacitors.

SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

PC 60-3

Electrical World

OCTOBER 31, 1960

Editorial Comment

Electrical World's Position on Public Power

Electrical World's editorial position on power supply by non-investor-owned utilities is restated below to prevent misconceptions which too frequently arise (see letter on page 3).

We believe strongly in the American free enterprise system and specifically as it applies to the electric power business. This means we believe that investor-owned utilities should supply America's power wherever and whenever they are willing and able.

However, citizens of a community or rural area have the right to choose whether their electricity be served by investor-owned company, or by municipal, cooperative, or utility district.

But the municipal, cooperative, or utility district should be required to:

1. Pay federal and states taxes equal to those of an investor-owned company.
2. Obtain funds from the open money market, using securities with fully taxable income.
3. Be subject to regulation of rates, service areas, and all other matters on the same basis as investor-owned companies, and by the same commissions.
4. Operate under the same laws and privileges as investor-owned utilities.

For a rural area in early stages of power development, low interest government loans and partial tax forgiveness might be necessary to promote otherwise non-economical line installations. But as soon as the subsidized system begins to accumulate surplus funds, the subsidies should be eliminated gradually and the system required to assume the full responsibilities outlined above. In no case should the government loan interest be lower than the average cost of money to the government at the time the loan is made.

The federal government should not be in the power business. The necessity and desirability of multi-purpose stream development is undeniable, and often the federal government is the only agency capable of such development. But power facilities, accruing therefrom, should be installed and operated by others with compensation being paid to the government at a rate commensurate with benefits. These payments would help defray the non-power costs of the multi-purpose development.

In an area where the federal government already is in the power business, and where other entities do not come forward to purchase the power facilities, federal power and wheeling rates should reflect costs which assume the tax-paying, conventional-funded status described above. Rates should be approved by the commissions having jurisdiction at the point of sales. State and local taxes should be paid. Federal power should be available to investor-owned and non-investor-owned utilities without discrimination.

Under the conditions set forth, no citizen would be taxed unfairly or inequitably for the advantage of another citizen in another part of the country in so far as power supply is concerned.

We have complete faith that, with inequities thus removed, the efficiency and initiative advantages of investor-owned companies vis-a-vis non-profit agencies would insure that virtually all US power business would be awarded to investor-owned companies by the citizenry.

The investor-owned utilities already have proved that they can handle this responsibility.

First Antitrust Trial Begins Today

The antitrust battle between the government and the electrical manufacturing industry moves from the grand jury room to a federal district court room today (Oct. 31) with the start of the trial in Philadelphia of the power switchgear assemblies case.

The course of this trial should be historic, setting the pattern for prosecution and defense strategy, as well as judgments, for trials to follow.

These trials, like the present power switchgear assemblies one, will be the second phase of a sweeping investigation into the pricing practices of the industry begun 17 months ago by four federal grand juries in Philadelphia. As a result of this investigation, some 20 criminal indictments have been handed down charging 29 companies and 47 individuals with price fixing, and in some cases, bid rigging and allocating business in the sale of electric power equipment used by utilities and industrials (see below).

The investigative phase has just about run its course. The latest indictment was handed down Oct. 20 and charged three watthour and demand meter manufacturers with price fixing (see p 25). Sources say the government will wind up its Philadelphia probe by looking into the condenser tubing and ACSR

Summary of Indictments, Offenses Charged, Companies and Individuals

PRODUCT GROUP	General Electric	Westinghouse Electric	Allis-Chalmers	Federal Pacific Electric	I-T-E Circuit Breaker	McGraw-Edison	Lapp Insulator	Ohio Brass	Porcelain Insulator	Joslyn	Hubbard	A. B. Chance	Southern States Equip.	H. K. Porter	Moloney Electric	Wagner Electric	Kuhlman Electric	Schwager-Wood	Allen-Bradley	Clark Controller	Cutler-Hammer	Square D	Foster Wheeler	Carrier	Ingersoll-Rand	C. H. Wheeler	Worthington	Sangamo Electric	Cornell-Dubilier	Number of Individuals Indicted	Fix Prices	Allocate business	Submit rigged bids	Submit rigged quotations	Refrain from selling to competitors	Submit fixed price bids	Enforce fixed price adherence by jobbers, etc.	Cease, Issue New Prices, Keep Records	Notify Customers	Civil Suit Prayer
	Companies Indicted																														Offenses Charged									
Power Switchgear Assemblies[1]	N	N	G	G	G																									12	✓	✓	✓		✓			✓	✓
Oil & Air Circuit Breakers	N	N	G	N	N																									5	✓	✓	✓	✓				✓	✓
Low-voltage Power Circuit Breakers[2]	N	N			N																									4	✓							✓	
Bushings	N	N					N	N																						–	✓					✓		✓	
Insulators	N				N	N	N	N	N			N		N																–	✓					✓	✓	✓	
Open Fuse Cutouts	N	N			N	N				N	N	N	N																	–	✓					✓			
Lightning Arresters																																							
Count I – Distribution	N	N				N		N		N	N			N																–	✓					✓		✓	
Count II – Intermediate & Station	N	N						N																						–	✓					✓		✓	
Count III – Arrester-cutout Combinations	N	N				N				N	N																			–	✓					✓		✓	
Distribution Transformers	N	N	G			N									N	N	N													5	✓					✓		✓	✓
Power Transformers	N	N	G			N									N	N														7	✓	✓	✓	✓				✓	✓
Instrument Transformers[3]	N	N	G																											–	✓					✓		✓	
Network Transformers	N	N	G			N									N	N														–	✓					✓		✓	
Power Switching Equipment[4]	N	N		N	N					N			N	N				N												6	✓	✓	✓	✓		✓		✓	✓
Navy & Marine Switchgear	N	N			N																									–	✓	✓	✓			✓		✓	✓
Isolated Phase Bus	N	N			N									N																–	✓	✓	✓			✓		✓	✓
Industrial Control Equipment[5]	N	N																	N	N	N	N								5	✓					✓			
Low-voltage Distribution Equipment[6]	N	N		N	N																N	N								–	✓					✓			
Turbine-Generators[7]	N	N	G																											4	✓		✓	✓				✓	✓
Steam Condensers		N	G																				N	N	N	N	N			5	✓		✓	✓				✓	✓
Power Capacitors	X	X				X		X																				X	X	–	✓				✓		✓	✓
Watthour & Demand Meters	X	X																										X		–	✓				✓		✓	✓

N - *Pleaded not guilty*
G - *Pleaded guilty*
X - *Plea yet to be entered*

[1] *Named Co-conspirators: McGraw-Edison, Moloney Electric, Wagner Electric*
[2] *Named Co-conspirators: Allis-Chalmers, Federal Pacific*
[3] *Named Co-conspirator: Sangamo Electric*
[4] *Named Co-conspirators: A. B. Chance, Cole Electric, Hubbard, McGraw-Edison, MEMCO, Royal Electric, USCO Power Equipment*
[5] *Named Co-conspirators: Allis-Chalmers, Arrow-Hart & Hegeman, Ward Leonard*
[6] *Named Co-conspirators: Norbute (General Switch Div.), Murray Mfg., Wadsworth Electric, Zinsco Electric Products*
[7] *Named Co-conspirators: Carrier, DeLaval Steam Turbine, Worthington*

in Philadelphia Federal Courthouse

products fields in the near future.

(In Milwaukee, in a separate action, a federal grand jury has for many months been looking into the pricing activities of pole-line hardware manufacturers, but no indictments have been handed down so far.)

After litigation of the criminal indictments will come litigation of the companion civil suits filed with all but one of the indictments. Then may come third-party damage suits. Therefore, with the Philadelphia docket situation allowing only four of these criminal trials to be held each year, final disposition of the whole matter will not be made for several years.

But interest right now is centered on the power switchgear assemblies trial, with Westinghouse, General Electric Co, and 6 GE individuals as defendants. What makes this trial interesting to legal observers is that guilty pleas on the same charges have already been entered by Allis-Chalmers Mfg Co, Federal Pacific Electric Co, and I-T-E Circuit Breaker Co, as well as by three Westinghouse and three Allis-Chalmers individuals.

These charges are: (1) fixing "prices, terms, and conditions for the sale of power switchgear assem-

(*Continued on page* 88)

Named, Pleas Entered, and Civil Suit Relief Requested by Government

POWER SWITCHGEAR ASSEMBLIES
- Lewis J. Burger; General Manager, Switchgear and Control Division; General Electric
- George E. Burens; Vice President & General Manager, Swgr & Control Div; General Electric
- * Landon Fuller; Assistant General Manager, East Pittsburgh Division; Westinghouse
- H. F. Hentschel; General Manager, Medium Voltage Switchgear Dept; General Electric
- Houston Jones; Mgr, Draw-Out & Load Center Sales Subsection, L-V Swgr Dept; General Electric
- * L. W. Long; Assistant General Manager, Power Equipment Division; Allis-Chalmers
- * Frank M. Nolan; Sales Mgr, Swgr Assemblies & Unit Substations; Power Eqpmt Div; Allis-Chalmers
- * A. W. Payne; Sls Mgr; Ass'd Swgr & Unit Eqpmt Sect, Ass'd Swgr & Devices Dept; Westinghouse
- Frank E. Stehlik; General Manager, Low Voltage Switchgear Department; General Electric
- * J. T. Thompson; Sales Mgr, Assembled Switchgear & Devices Department; Westinghouse
- A. F. Vinson; VP & Group Executive, Apparatus & Industrial Group; General Electric
- * David W. Webb; Manager, Switchgear Dept, Power Equipment Division; Allis Chalmers

OIL & AIR CIRCUIT BREAKERS
- Clarence E. Burke; General Manager, High Voltage Switchgear Department; General Electric
- Royce C. Crawford; Marketing Manager, High Voltage Switchgear Dept; General Electric
- * L. W. Long; Ass't General Manager, Power Equipment Division; Allis-Chalmers
- William H. Schiek; Mgr, Power Circuit Breaker Sales, H-V Switchgear Dept; General Electric
- J. W. Stirling; Manager, Power Circuit Breaker Dept; Westinghouse

LOW VOLTAGE POWER CIRCUIT BREAKERS
- R. W. Ayres, Jr; Mgr, Air Circuit Brkr, Fuse & Accessory Sls Subsect, L-V Swgr Dept; General Electric
- W. T. Pyle; Sls Mgr, Swgr Devices Section, Assembled Swgr & Devices Dept; Westinghouse
- Frank E. Stehlik; General Manager, Low Voltage Switchgear Dept; General Electric
- J. T. Thompson; Sales Mgr, Assembled Swgr & Devices Dept; Westinghouse

DISTRIBUTION TRANSFORMERS
- M. A. deFerranti; General Manager, Distribution Transformer Department; General Electric
- Gordon Hurlbert; Manager, Distribution Transformer Department; Westinghouse
- W. R. Swoish; Sales Manager, Pennsylvania Transformer Division; McGraw-Edison
- A. R. Waehner; Director of Transformer Sales, Line Material Industries Div; McGraw-Edison
- Joel Watkins; Vice President & Manager, Transformer Division; Kuhlman Electric

POWER TRANSFORMERS
- J. H. Chiles, Jr; Vice President, Division Manager, Transformer Division; Westinghouse
- W. S. Ginn; Vice President & General Manager, Transformer Division; General Electric
- R. N. McCollom; Manager, Power Transformer Dept, Transformer Division; Westinghouse
- * J. W. McMullen; Vice President & General Manager, Power Equipment Division; Allis-Chalmers
- J. W. Seaman; General Manager, Power Transformer Dept, Transformer Div; General Electric
- R. W. Smith; Vice President & General Manager, Transformer Division; General Electric
- W. R. Swoish; Sales Manager, Pennsylvania Transformer Division; McGraw-Edison

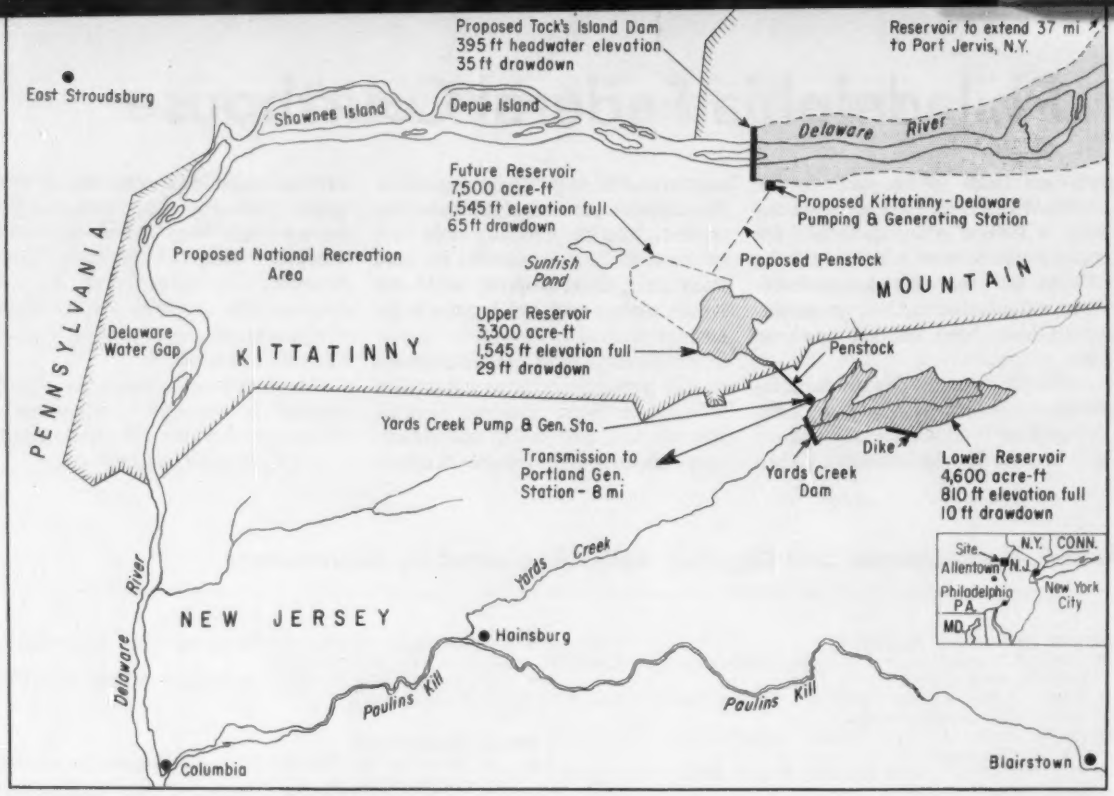
POWER SWITCHING EQUIPMENT
- J. E. Cordell; Vice President—Sales; Southern States Equip.
- W. T. Pyle; Sales Mgr, Swgr Devices Section, Assembled Swgr & Devices Dept; Westinghouse
- G. L. Roark; Marketing Manager, High Voltage Switchgear Department; General Electric
- John Romano; General Sales Manager, Delta-Star Electric Division; H. K. Porter
- H. K. Wilcox; Division Manager, Greensburg Division; I-T-E
- W. Maxwell Wood; Secretary-Treasurer; Schwager-Wood

INDUSTRIAL CONTROL EQUIPMENT
- J. M. Cook; Vice President, Marketing; Cutler-Hammer
- T. C. Finnell; Sales Manager, Systems Control Dept, Motor & Control Div; Westinghouse
- E. R. Jung; Vice President, Marketing; Clark Controller
- F. F. Loock; President, General Manager, & Sales Manager; Allen-Bradley
- W. F. Oswalt; General Mgr, General Purpose Control Dept, Swgr & Control Div; General Electric

TURBINE-GENERATORS
- W. S. Ginn, Vice President & General Manager, Turbine Division; General Electric
- C. I. Mauntel; Sales Manager, Steam Division; Westinghouse
- W. C. Rowland; Vice President, Steam Division; Westinghouse
- W. E. Saupe; General Manager, Large Steam Turbine-Generator Department; General Electric

STEAM CONDENSERS
- H. G. Conkey; Vice President, Domestic Sales; Ingersoll-Rand
- M. H. Howard; Manager of Production; Foster Wheeler
- C. I. Mauntel; Sales Manager, Steam Div Staff; Westinghouse
- L. G. L. Thomas; President; C. H. Wheeler
- A. M. Tullo; Vice President; Worthington

• Pleaded not guilty. * Pleaded guilty.



Two projects in New Jersey hills will . . .

Produce 750 Mw From Pumped Storage

Pumped storage generation of approximately 750 Mw has been proposed by New Jersey Power & Light Co for two sites within five miles of Delaware Water Gap. The first of these, planned for completion by 1964, will lie entirely in the watershed of Yards Creek. The second, planned for completion coincidental with the Tock's Island Dam proposed by US Army Corps of Engineers, is expected to go on line in 1975. These two projects are in addition to the company's previously announced Longwood pumped storage plant (EW, Aug. 19, 1957, p 73).

Construction of the Yards Creek project will begin early in 1961, according to NJP&L's current plans. A small dam across Yards Creek in the foothills of Kittatinny Mountain will store 4,600 acre-ft of water on 270 acres of partly swampy land from the stream's natural runoff. A 160-acre upper reservoir formed by a dam and dikes near the crest of the 1,600-ft mountain will receive 3,300 acre-ft of water, pumped 745 ft up the steep slope from the Yards Creek reservoir.

Generating capability of the Yards Creek project was originally estimated at 150 Mw. But the company plans to boost its capability to over 250 Mw. This generation will be linked to the New Jersey-Pennsylvania-Maryland interconnection via an eight-mile transmission line to Metropolitan Edison's Portland Steam Station. Thus its peaking capability will supplement Pennsylvania Electric Co's proposed 75 to 300 Mw on the Allegheny River (EW, Oct. 10, p 48).

$25-Million Total Cost Seen

Steam plants in the interconnection will provide the off-peak power to pump water to Yards Creek's mountain-top reservoir. Cost of the total project is expected to exceed $25 million.

The second NJP&L proposal, known as the Kittatinny-Delaware Pumped Storage Project, will be considerably larger than Yards Creek, early estimates showing 400 to 550 Mw. It will use the 15,000-acre reservoir in the Delaware River Valley to be created by the US Engineers' 160-ft-high Tock's Island Dam as a lower reservoir. Its pumping and generating station on the shore of Tock's Island reservoir.

The upper reservoir for the Kittatinny-Delaware plant will also be formed by dams and dikes on the mountain top adjacent to Yards Creek's upper reservoir. Storage of 7,500 acre-ft is planned with a maximum head of 1,185 ft.

New Jersey P&L has offered to transfer up to 150 million gpd of water through the two pumped storage plants from Tock's Island reservoir on the Delaware to Yards Creek to supplement the public water supply of northern New Jersey. This transfer would be accomplished by interconnecting the two reservoirs on the crest of Kittatinny Mountain so that part of the water pumped from the Delaware would flow through Yards Creek Station.

Federal expenditures for 3,200-ft-earth-filled Tock's Island Dam and reservoir are estimated at $88 million. Hydroelectric facilities will add $66 million.

Nez Perce Men Charge 'Influence'

Series of motions to strike testimony must have approval of Presiding Examiner William Levy to become effective

Sparks are flying in the controversy over proposed construction of rival Nez Perce and High Mountain Sheep dams, now before the Federal Power Commission.

Charges of improper influence were filed last week against the FPC staff by attorneys for the Nez Perce applicant, Washington Public Power Supply System. FPC Staff Attorney Donald A. Sander answered immediately, calling the charges "an unwarranted and malicious attack on public servants, wholly without justification or foundation."

Nez Perce attorneys (Evelyn Cooper and Joseph Sharlitt) had charged that the recent testimony by four FPC staff engineers (EW, Oct. 17, p 48) indicates a "clear bias" and "preconceived conclusions reflected in it" in favor of the rival High Mountain Sheep project, proposed by Pacific Northwest Power Co. The Nez Perce attorneys also filed a motion to subpoena Francis L. Adams, chief of the Commission's Bureau of Power, and Lesher S. Wing, regional engineer in the FPC San Francisco office, to answer the allegations.

FPC Attorney Sander replied that the Nez Perce charges apparently "stem from illogical reasoning," and called the charges "inconsistent, evasive and confusing." He added, "until it is developed through proper cross-examination (to begin Nov. 4, unless delayed) that any one of these (four FPC) witnesses was influenced (by Adams or Wing) to testify against his own judgment, or other than as he believes, no basis for an accusation of bias or impropriety exists . . ."

Witnesses Not Accused

"No contention is made herein of improprieties on the part of the staff witnesses themselves," the Nez Perce attorneys state, but "the gravity and scope of the impropriety and bias is such that the undersigned counsel (Sharlitt and Cooper) represent that reasonable grounds exit for the belief that the entirety of the Commission staff's testimony is a product of bias and, accordingly, properly subject to a motion to strike" it from the record. No motion to strike the entire testimony was filed, however.

The Nez Perce charges continue: "If authority is granted, defendant Adams will be asked to testify concerning the matter of instructions or communications transmitted to the Commission's San Francisco regional office which had the purpose, or effect, of influencing the testimony of the Commission's staff witnesses in this proceeding. If authority is granted, defendant Wing will be asked to testify concerning the receipt of instructions or communications from any source outside the Commission's San Francisco office, having the purpose, or effect, of influencing the testimony of the Commission's staff witnesses in this proceeding . . ."

Some of the Nez Perce complaints against the FPC staff testimony are:

- "Adoption of Ebasco's Nez Perce arch dam design, prepared for applicant Pacific Northwest Power Co, but not submitted as part of said applicant's direct case;
- "Use of capital cost estimates for fish passage facilities for High Mountain Sheep and Lower Canyon projects for which there are no designs or other foundation or support in the record;
- "Use of the Ebasco High Mountain Sheep design and WPPSS Nez Perce design, these designs being altogether incomparable;
- "Use of correspondingly incomparable capital and annual costs;
- "Use of different power values for the two projects, despite the fact that they would both come into production at approximately the same time;
- "Assumption of a 10-year delay in the construction of the Nez Perce and Lower Canyon projects 'because of a fish problem,' which assumption is nowhere supported on the record and is inconsistent with the record."

In addition to the motion against Adams and Wing, WPPSS filed a thick list of other motions to strike specific parts of testimony by PNP and FPC staff witnesses. PNP Board Chairman Kinsey Robinson and Ebasco Engineering Manager Charles Bonin took the brunt of these charges. Bonin specifically was criticized for testifying on geological conditions, charging he is "not qualified" to testify on such matters. Other witnesses and statements were challenged as "indefinite, irrelevant, ambiguous, vague, meaningless, unsupported and incompetent."

High Mountain Sheep attorneys, in turn, challenged cost statements by Nez Perce witness Charles Keith Willey, vice president and western manager of Harza Engineering Co. Much of Willey's data, says the PNP motion, is based on outdated Corps of Engineers "reconnaissance" data for the two projects. If Willey's challenged figures are thrown out by the examiner, this will force deletion of benefit-to-cost testimony by Robert Gallup, principal engineer for R. W. Beck & Associates, because Gallup's figures are premised on Willey's PNP claims.

PNP also moved to strike certain testimony on the proposed Nez Perce fish facilities by William R. Martin, head of Harza's fishway department, because Martin is "not qualified" as a biologist. And PNP motions also called for deletion of "unfounded" testimony by William Trommershausen, executive engineer for Beck, concerning possible construction of transmission lines from Nez Perce by Bonneville Power Administration.

The FPC staff filed motions to strike Trommershausen's testimony on possible Bonneville power lines and wheeling of power. Other FPC staff motions to strike Nez Perce testimony included:

- William Yeomans, "no adequate foundation" for his claim that Nez Perce would have 400,000 man-days yearly of recreation use, and "no evidence" that this would be 100,000 man-days higher than that for combined High Mountain Sheep and Lower Canyon projects;
- Fish expert Harlan Holmes, "inconsistent" and "unqualified" testimony on whether the proposed Nez Perce fish lock (through the dam) would work properly.

Full-Scale NEAR Test Is Successful

Consumers Power Co cooperates with Office of Civil and Defense Mobilization to try high frequency alarm system

At exactly 12:12 pm, Oct. 11, 1,067 helium-filled weather balloons rose lazily above the little mid-Michigan town of Charlotte. Each balloon meant that a National Emergency Alarm Repeater (NEAR) unit had been triggered successfully in the home of a Charlotte resident.

Meanwhile, inside the high school auditorium, 300 guests, including utility officials, equipment manufacturers, military, and press, watched the actual triggering of this first large scale test of NEAR. One by one state police posts in a 14,000-sq-mile area of Michigan called in to report receiving the alarm.

NEAR is a small, 3x3x2-in. receiver that, when plugged into a 110-v household outlet, will pick up a 1-v, 240-cps signal superimposed upon the ordinary 60-cps utility service. After a 70-second delay from the time the alarm button is pressed, the receiver emits a buzzing noise loud enough to wake the residents of a three bedroom home.

Consumers Power Co, in whose service area the test was held, has been cooperating with the Office of Civil and Defense Mobilization, since November, 1956, in field tests to determine the practicability of the project.

The installation consists of one, three-unit bank of inductors. Each single-phase unit is connected between two phases of the 46-kv bus. Line-connected windings are delta connected to the power system. The biasing windings are delta connected, with one corner of the delta open for insertion of dc excitation from a 700-amp selenium rectifier. The inductor bank, when on standby, appears as an unloaded transformer. The signal is initiated by first opening the delta connection of the biasing winding and then applying dc current from the rectifier. AC power to the rectifier is supplied by the station-service circuit.

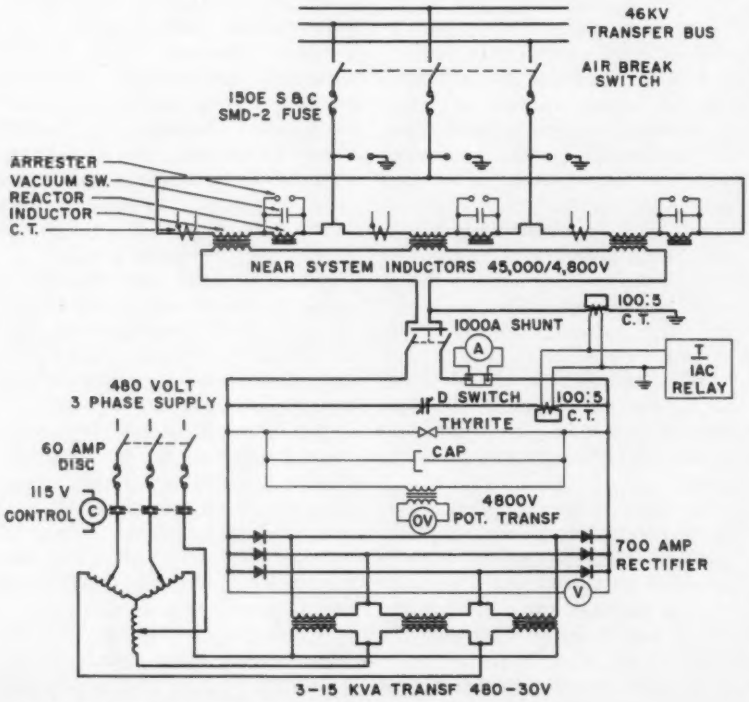
The dc excitation asymmetrically biases the inductor core, creating a non-linear impedance that draws an exciting current with a substantial fourth harmonic (240-cps) component. This fourth harmonic current, flowing through system impedances, produces fourth harmonic voltages that are superimposed on the 60-cps wave throughout the system. The 240-cps voltage is low in magnitude (relative to the 60-cps voltage) and will not affect common system loads. It is sufficient, however, to trip the NEAR receivers because of their high 240-cps sensitivity.

The voltage will carry a signal 40 to 50 miles at high strength; about 100 miles at low strength. When the signal is in operation, the inductor circuit draws 265 amp of current of which 65 amps is 240-cps component that creates 1 to 2% 240-cps voltage component on the system 60-cps voltage.

The Grand Rapids bank experiences 32-kw electrical loss or 100 kva excitation level on standby; about 20-Mva excitation level on signal.

Equipment was designed by Midwest Research Institute. The three inductors were manufactured to specification at a cost of about $90,000 by General Electric Co, and the receivers were furnished by AC Spark Plug Division of General Motors Corp. AC estimates that, in volume, the receivers could be put into consumer hands for about $10 each. OCDM research funds paid for the test equipment, although Consumers Power donated considerable engineering and installation overhead.

According to Lewis E. Berry, deputy director of OCDM, plans to finance the system on a nation-wide basis have not been formulated. He presumes that Congress would appropriate funds to install signal generation equipment in utility plants; that the utilities would offer maintenance and use of their lines; and that the public would purchase the receivers.



DC EXCITATION BIASES INDUCTOR CORE, producing substantial 240-cps component, which operates NEAR alarm

News Scope

ATOM ITEMS—Control rod drives and most of the nuclear instrumentation and safety system for Indian Point nuclear power plant of Consolidated Edison Co have been shipped by General Electric. The plant is supposed to go into operation next year . . . **The boiling-heavy-water reactor** at Halden, Norway, has made its first steam. Its first core is natural uranium. Unit is operated by the European Nuclear Energy Agency of the OEEC . . . **Going on the line this month** is the Army's PM-2A reactor plant at Camp Century, Greenland. It will furnish all the power for the outpost (1,560 kw), as well as 1,000 lb per hr of heating steam.

NEW CUSTOMER — Bonneville Power Administration has signed a 20-year contract to supply 120,000 kw of power to a new steel mill at Anaconda, Mont. Webb & Knapp, Inc, New York, will build the plant. BPA must build a 230-kv line from Noxon switchyard to its Hot Springs substation, plus build a new substation at Anaconda. Revenues to BPA will be about $2.1 million annually.

ELECTION DAY — When asked about the outcome of the presidential race, David A. Hamil, REA administrator, told an *Electrical World* reporter: "At this time in 1956 I would have been willing to sign a four year lease here (Washington)." Now, however, he said, "There are issues, but the voters don't talk about them very much. That's why it's so tough to make a prediction now" . . . **Glasgow, Ky., voters** get to cast ballots again to see whether the city will buy Kentucky Utilities Co properties. It was defeated in 1959.

Dateline . . . Vancouver, B. C. (*Continued from page 5*)

logic applied by the International Columbia River Engineering Board in allocating the power. This logic holds that each country be paid enough in power to cover its incremental costs and that any excess over this repayment power be divided equally between the two countries.

Incremental costs for Canada are high as she must build large dams and control works. Incremental costs for the US are relatively low, according to the Board, as they cover little more than additional generators at existing plants and transmission to deliver Canada's share of the power to the border. When these investments are converted to annual charges, with Canada paying interest at 5% while the US portion pays a subsidized 2.5%, the allocation of power to repay Canada's incremental costs becomes unrealistic. And the average cost per kwhr of all power delivered to Canada becomes so much greater than the apparent cost of the US share that dissatisfaction seems inevitable.

This issue seems to have been ignored by the Columbia River negotiators in their recent recommendation for an enabling treaty. They propose that Canada build, at her own expense, dams on the Columbia at Mica Creek and Arrow Lakes and on the Duncan River at Duncan Lake to store 15.5 million acre-ft of water. Canada's costs are placed at $450 million by Prime Minister Diefenbaker. The US will pay Canada an amount estimated in Diefenbaker's statement to total $65 million for flood control benefits on the lower Columbia. The US will also integrate generation from release of the stored water into existing and projected hydro and thermal generation of the lower Columbia basin to gain dependable capacity and deliver half of these "power benefits" to Canada. Diefenbaker places Canada's annual share at "over 6 billion kwhr . . . at somewhat below 4 mills . . . substantially less than present costs of power in that area."

Our Canadian friends are quite reasonable about this. Only last month at the Pacific Northwest Trade Assn's general conference, John Davis of B. C. Electric Co said:

"We should review every possibility and select only those plans which . . . promise to be to the greatest advantage of all our peoples.

"No party should engage in any . . . scheme which is less advantageous to itself than some other course which it could pursue . . . by itself.

"Advantages [gained by co-operation] should be shared equally between the participants.

"The difference between our separate costs and the costs of co-operative action is the best measure of the advantages which each partner can obtain."

Davis' philosophy seems completely logical. So does his willingness to accept interest charges at 5% on Canadian expenditures and only 2.5% for the US. But on this point he commented:

"It can be argued that the true (non-subsidized) cost of money in the US is comparable to that in Canada. Indeed, most economists would suggest that 6% be used in both countries . . . The fact remains, however, that 2.5% money is made available by the US government for hydroelectric development schemes in the Pacific Northwest."

Thus the matter of subsidy for federal power, long a bone of contention in domestic arguments, now threatens to complicate international development of the Columbia River. And, unless negotiations are based upon the true cost of money, American taxpayers will begin to subsidize power generated for Canada.

A-Power Delayed by Steam Progress,

Fall meeting at Chicago hears conventional generation still advances; Habirshaw award goes to GE's S. B. Crary

While utilities sought to establish commercial nuclear power, long-established steam power improved its own economy, the American Institute of Electrical Engineers was told at its recent fall general meeting in Chicago, Ill.

Reductions in steam power cost, said John J. Grebe, Dow Chemical Co, were the result of a combination of improved efficiency and lower coal costs.

Nuclear power could be utilized more economically, he said, by blowing a pressure cavity with a hydrogen bomb and initiating combustion in deep beds of low-grade coal. The steam and gas thus generated, when controlled, could be fed to a turbine at 2,000 psi for generating electricity.

Meanwhile work should be pushed to develop small automatic atomic plants, probably with helium-cooled, liquid-metal-fuel reactors driving gas turbines on sites approximating those of a distribution substation where they could supply electricity along with by-product heat for space heating and cooling, Grebe concluded.

S. B. CRARY received in absentia Habirshaw Award for T&D contribution

The meeting's general session heard Dr Ernst Weber, president, Polytechnic Institute of Brooklyn, urge broader education for engineers to "assure recognition of the individual engineer at all levels by increased social, political, community responsibility."

"Today's society is so intricately tied to technology in all its aspects that one must wonder why the technologist has taken so little part in government, and why so little credit, if any, goes to the engineer who creates this modern setting of society," said Weber.

Weber, along with a university professor and three electrical engineers was recipient of AIEE awards. He received the AIEE's medal for electrical engineering education. Prof Perry A. Borden, University of Dayton, got the Morris E. Leeds award for electrical measurements in the "field of recording, control, and telemetry." Dr Selden B. Crary, General Electric Co, was awarded the William A. Habirshaw award; Rudolph Kompfner, Bell Telephone Laboratories, Inc, the David Sarnoff award; and, Dr Merwin J. Kelly, retired chairman of the board, Bell Telephone Laboratories, Inc, the first award named in his own honor.

About 350 technical papers were read during the meeting's 60 sessions.

General Electric's P. E. Benner, J. B. McClure, and A. G. Mellor authored a paper on new energy sources still largely unexplored.

"The economics of converting low-grade energy sources—ocean temperature, solar energy, and geothermal energy—into usable power has proved formidable," the paper said. "But new methods of energy conversion will make it possible to tap some of these sources for economic power."

Focus on Peaking Plants

Meanwhile, the drive for further economy in conventional power generation has focused on the design and operation of plants for load peaks, it was pointed out by A. C. Sugden, Long Island Lighting Co, who reported that adding a stripped down, 100-Mw, oil-fired, non-reheat unit of low short-circuit ratio to the 1,250-Mw system would save over $3 million present worth during its 35-year life. But the availability over an existing 300-Mw interconnection of ample spare capacity on Consolidated Edison's summer-peaking system to help LILCO carry winter peaks has deferred the 100-Mw peaking project. LILCO will, however, install two 2-Mw diesel generators to experiment with peak shaving at remote load centers, he said.

"Large, high-efficiency, steam turbine-generators are still the most effective way to achieve lowest cost electric power," said R. D. Camburn, Commonwealth Associates, in a paper co-authored by O. A. Lentz. "There is little incentive for installing peaking generation, except perhaps pumped-storage hydro, on systems in a position to consider a unit of 150 Mw or greater." But gas turbines and diesels, "by virtue of being installed closer to load centers," offer some economy for systems unable to use steam units as large as 150 Mw, they said.

In discussion C. W. Bary, Philadelphia Electric Co, claimed that peak-shaving diesels show savings on systems of all sizes because they permit close matching of generating capacity to load with minimum reserve margins. C. J. Baldwin, Westinghouse Electric, said Public Service Electric & Gas Co studies show a place for peaking units, but that old units are the cheapest peaking

AIEE Hears

C. H. LINDER (left), AIEE president, presents Morris E. Leeds Award to Prof Perry A. Borden, U. of Dayton, for contributions to electrical measurements

capacity available. Where base load stations burn gas or oil, as in the Southwest, peaking units cannot be justified, he said.

Digital simulation permits rapid analysis of system expansion to ascertain economic unit sizes, probable outage rates, and the service quality, said C. J. Baldwin, Westinghouse Electric Corp, in a paper authored with C. A. DeSalvo, Westinghouse, and H. D. Limmer, Public Service E&G. For a system the size of Public Service's, it proves large units economical, even to 1,000 Mw where interconnections provide backup. Moderate expenditures for reliability can provide acceptable service quality, he said.

"Measurement of system reliability should be an essential of planning for generating unit additions, interconnection, and spinning reserve practices," said a working group on probability methods. Numerical calculations alone cannot handle system reliability but must be bolstered by judgment and probability methods.

EHV Advances Told

Transmission engineers interested in progress in extra-high-voltage lines listened to speakers on the probable trends in multi-conductor systems above 460 kv and on the preparatory work on the country's first 460-kv line.

Significant improvements in electrical performance of EHV lines and reduced capital costs are possible, said R. W. Harmon, Ohio Brass Co, when towers on such lines are designed for new suspension hardware for multi-conductor bundles.

Harmon cited these conclusions from laboratory tests:

1. Prototype suspension assemblies, coupled as low as possible with respect to the conductor system, have demonstrated that control rings can be eliminated at voltages to at least 650 kv. These assemblies should operate at 650 kv with less RIV than found on existing 345-kv suspension assemblies.

2. Very substantial economic savings can be realized through use of short-coupled suspension assemblies, if right-of-way widths are reduced and smaller towers are designed for the special assemblies.

3. There is no foreseeable upper limit on transmission voltages using conventional cap-and-pin suspension assemblies.

Discussion on three papers describing preparatory work on the 460-kv prototype line built by Pennsylvania Electric Co brought out these comments:

In structures and towers, said C. M. Ferguson, W. R. Cover, and P. L. Lumnitzer, all of Penelec, because of the flexibility of wood, there are differences in the longitudinal unbalance assumptions due to ice loading. This flexibility places a higher longitudinal load on steel towers when a wire breaks. Members were selected for the worst combination of vertical, longitudinal, and transverse stresses, they said.

Although 26 insulators per string (including one each for hot-line maintenance and for defective unit) may appear excessive, operating experience will show whether the total number can be reduced. To prevent leakage-current or corona damage to wood poles, all metal fittings are bonded or banded, except on six wood structures for testing. Portal towers are in the line for evaluation on level terrain.

S. J. Polaski and C. M. Ferguson, both of Penelec, and D. J. Heller and F. A. Fisher, General Electric Co, said that, before the 460-kv line was built, tests were made on models at GE's laboratory at Pittsfield, Mass., to find the probable lightning performance and to show where tests on the actual line should be made.

R. J. Bacha and E. S. Kocsan, both of Penelec, and W. C. Guyker, West Penn Power Co said that RI testing on the 460-kv line will start this month and will run for two years. Tests of ambient RI reference levels were made over the past year. Tests on the energized line will determine what ranges of RI noise levels persist for what percentage of time.

Actual savings in cost of transmission structures can well reach 10% when a computer is used to spot towers, said V. Converti, E. J. Hyland, and D. E. Tickle, Arizona Public Service Co. But the computer program must be sufficiently versatile to spot towers, at a given time, of either wood or steel structures ranging from 115 to 345 kv. The program also will work for H-frame 69-kv construction. A minor subroutine can be written, the authors said, to accommodate 69-kv H-frames intermixed with single poles. The computer output is available for automated material control and placement of orders.

Savings will result from use of fewer structures and/or shorter structures over a given distance. This was found by computer spotting of towers against actual locations on two lines. The more reliable cost es-

timates provided by computer spotting should enhance the use of aerial surveying of alternate routes to permit the selection of the most economical right-of-way.

The trend to higher transmission voltages spurs study of economical protection of substation equipment against lightning and switching surges, and the corresponding rise in sub-transmission voltages is reflected in very large distribution substations. Both subjects received attention at sessions sponsored by the Substations and the Protective Devices committees.

Distribution Subs Reach 168-Mva

Distribution expansion for Houston Lighting & Power Co today is based upon a standard design of substation capable of expansion to four 25/33/42-Mva LTC transformers and up to 20 12.5-kv feeders, said R. M. McCuiston in a paper co-authored by E. F. Wilson and J. M. McReynolds, all of the Houston utility. Designed for economy and flexibility, the station structures facilitate progressive development from a pair of 7.5/9.3-Mva transformers to 15/20/25 and, ultimately, 25/33/42-Mva units. In some cases, the additional capacity is provided in a third and fourth unit of 7.5/9.3 Mva.

Firm capabilities assigned to these substations range from 67% of total forced-cooled nameplate capacity for two banks to 100% for four banks, he said. And outgoing feeders, assigned 8,000-kva normal loading, are permitted to reach 12,000 kva in emergency. But stations serving network feeders are restricted to 50% of forced-cooled rating for two banks, 67% for three banks, and 75% for four.

High-side structures provide for supply at either 69 or 138 kv from a loop, or from two or more separate circuits, he continued. Switching at major substations is by oil circuit breakers, but other sites have high-speed grounding switches and motor-operated disconnects.

Low-side buses are sectionalized to hold fault currents on the 15-kv oil circuit breakers to 250 Mva, he said. An exception was made for three large stations serving the underground network, where parallel operation imposes 500-Mva to 1,000-Mva fault duties.

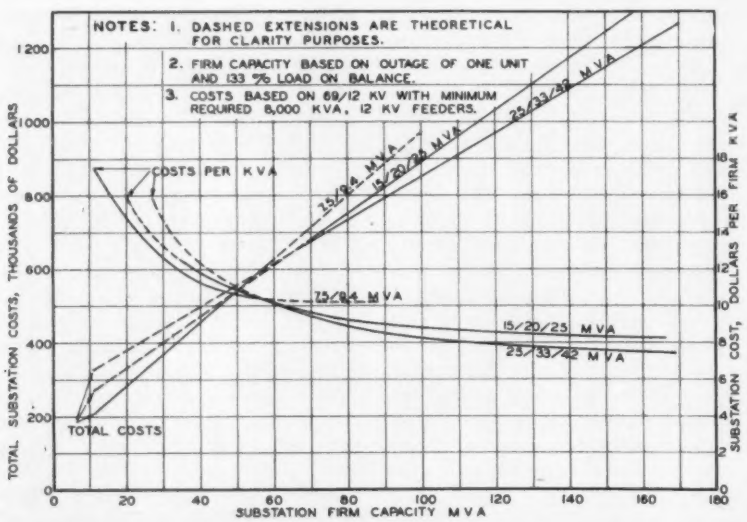
Transformer purchases today are usually restricted to the larger sizes to force economical relocation of the older, small banks to new sites.

In discussion, G. A. Mason noted that Commonwealth Edison has evolved a somewhat similar approach to 12-kv distribution substations, contemplating a 160-Mva maximum installation for 138-kv supply. And R. S. Melville, Southern California Edison, commented that the Houston plan seemed to include adequate provision for service reliability. From the economic point of view, utilities should not hesitate to put distribution substations directly on a 138-kv supply, said J. A. Smith, General Electric.

Economy is a powerful incentive to use line entrance gaps for high-voltage substations, said T. F. Watson and R. Hiatt, both Commonwealth Associates. Their installed cost at 69 to 345 kv is only 20% that of lightning arresters. Although gaps do not match arrester characteristics, they extend protection to equipment beyond reach of the station arresters. Experience over 13 years has demonstrated that horn gaps of square steel rod bearing a brass arcing tip give protection resembling that of the AIEE standard rod gap for installations up to 161 kv in moderately severe thunderstorm areas, they said.

Recent efforts have developed a gap suitable for 345-kv service, they continued. Made of 2-in. steel pipe with 8-in. spherical terminations, it has demonstrated freedom from corona and RIV below 10 μv for a 55-in. gap at 20% over maximum line-to-ground voltage for 345-kv.

The reliability of today's substation transformers has become so good that the additional expense of high-side circuit breakers often cannot be justified, said K. A. Thallner, I-T-E Circuit Breaker. Adequate protection for transformers up to 230-kv can be provided in many cases with high-speed, spring-operated grounding switches triggered by transformer differential relays to trip remote supply-line breakers in 10 cycles or less. An auxiliary contact can open a motor-operated disconnect during the breaker-open period, permitting reclosure in a few seconds to pick up other load on the supply circuit.



SUBSTATION COSTS HELD LOW by adding and replacing multi-rated banks in Houston's new program. Maximum development serves 168 Mva

Substation Footings Standardized

Installation and changeout of substation transformers from 12 to 100 Mva on the Virginia Electric & Power system have been facilitated by use of two standard designs of concrete foundations, one for locations where a good bearing is obtainable within 7 ft of the surface and the other for sites where deeper excavation is required. They are made in two pours, the first to form a slab as a working base for forms used in the second pour to shape the pedestal or piers on which the

transformer will sit. These foundations, said A. H. Thiermann Jr, will accommodate 105 of the company's 107 units.

Structure foundations are poured in holes bored with earth augers, according to C. G. Shell, Ohio Edison, and R. C. Adler, Commonwealth Associates. The first pour in their method locks reinforcing steel in place and fills the bored hole to 2 or 3 ft below the grade. Forms are then placed to hold anchor bolts and shape the top and the pouring is completed. This procedure has produced up to 40 foundations per day with an 18-man crew, they said.

Arrester Overvoltages Studied

Calculated overvoltages during line-to-ground faults on four-wire, multi-grounded distribution circuits may reach 1.25 per unit even when positive-sequence resistance is included, according to an AIEE working group report presented by G. G. Auer, General Electric. But the fact that this factor would boost the voltage above the ratings of lightning arresters commonly applied with excellent results to circuits operating at EEI-NEMA maximum tolerable levels, implies that other factors omitted from the calculations are holding down the voltage. Such factors are:

1. Distribution transformer exciting current.
2. Fault impedance.
3. Voltage drop caused by load current.
4. Variation in ground resistivity.

In discussion, J. L. Koepfinger said that Duquesne Light Co has calculated and field-tested phase-to-ground voltages on its 23-kv grounded-neutral subtransmission to determine whether 18-kv lightning arresters could be used on extensions planned to supply distribution transformers. Voltage on unfaulted phases was measured at 65, 74 and 62% of phase-to-phase voltage at locations where calculations indicated 69, 80 and 69%, respectively, he said. S. B. Howard, General Electric, suggested that the successful use of distribution arresters at or slightly above their ratings might reflect tolerance built in to withstand the 20-shot proof test.

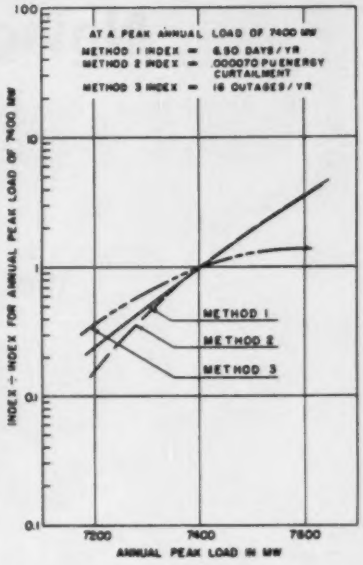
Lightning arresters today protect 750 BIL insulations with as much margin as older arresters gave at 900 BIL, reported G. D. Breuer, General Electric, for another AIEE working group. But the protective margin becomes closer for switching surges. This shift to slower waves as the limiting condition permits more latitude in locating lightning arresters, particularly for multi-line substations, he said.

Oscillograms, made when repetitive low-voltage surges are fed to a model of the surge impedances, speed analyses of lightning protection for complex circuits and lead to more economical designs, claimed H. R. Armstrong of Detroit Edison in a paper co-authorized by B. D. Miller. The method was applied recently to analyze switchyard protection for St. Clair Power Plant, including its No. 6 Unit then under construction. The yard's ring bus was simulated by single-layer coils of No. 27 wire on lucite tubing. Similar coils at appropriate points simulated the 11 outgoing 120-kv lines and bus reactors. Transformers were simulated by capacitors from the bus to the copper ground strap and circuit breakers, by low-voltage switches. Station-type 109-kv arresters were represented by radio type diodes in series with a small battery and resistor to simulate sparkover limited by 31 ohms resistance at 10,000 amp.

Queried about the method's accuracy, Armstrong estimated that measurements have checked within 5%. He said that the method has already demonstrated that three sets of lightning arresters can be omitted safely from one station yard.

Proposes Self-protecting Breakers

Specified voltage tests should be changed to insure that circuit breakers will stand up under voltages encountered at line terminals, especially when breakers are open or opening, said C. E. Asbury, Commonwealth Associates, in a paper co-authored by Otto Naef, American Electric Power Service Corp. Observing that lightning protection cannot be justified for each breaker position and arresters provided to protect transformers may be too far away, the authors urged that breakers be made self-protecting. This is inherent in certain types whose internal insulation exceeds bushing strength. But other types may require external rod gaps set for a suitable margin and proved by chopped-wave tests. All circuit breakers built with isolating gaps in series with interrupting gaps should withstand full switching overvoltages at intermediate contact positions without damage, they said.



RELIABILITY INDEX shows different trend for varying expansion programs

Judging from the discussion, there is considerable interest in a new reclosing relay which meets the special reclosing requirements presented by a ring bus. L. A. Davidson and V. M. Hines, both of Oklahoma Gas & Electric Co, designed and built the relay which offers positive control of the operating sequence of the bus breakers and has self-contained line-checking and interlock features. This reclosing relay, report the authors, could easily be adapted for automatic reclosing in the double breaker or the breaker-and-a-half type of substation.

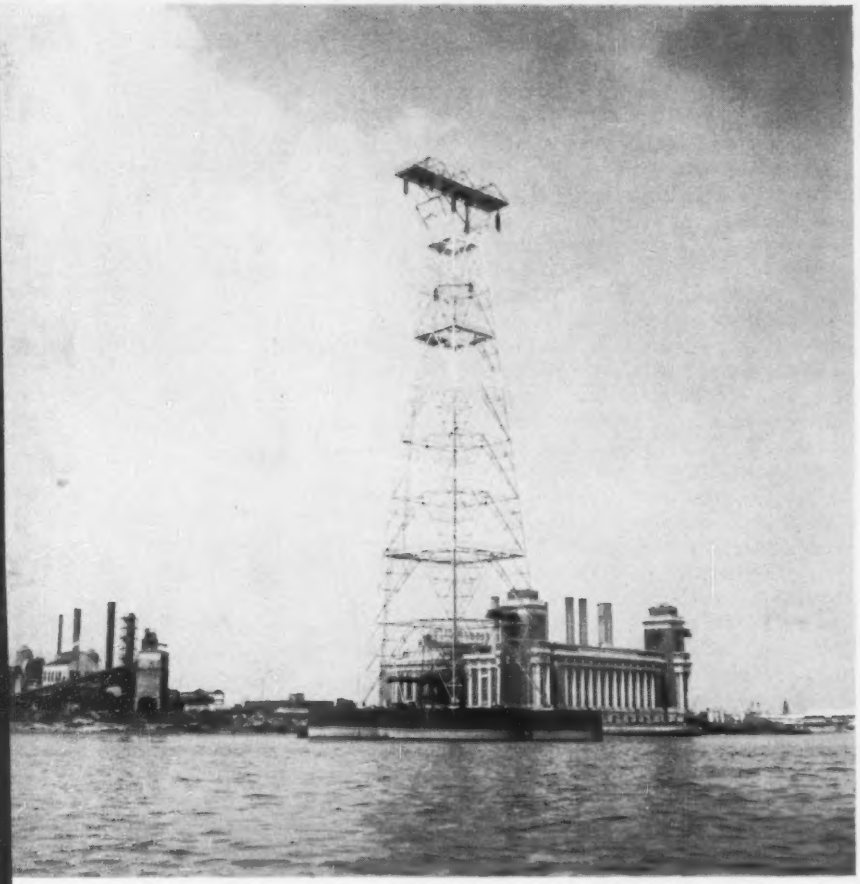
Restoration of a line connected to the ring bus is the primary objective of the reclosing relay, said the authors in describing their device. If the line fault persists, the relay will open the line air-break switch and close the breakers to restore the bus section to normal. If the ring bus is faulted, the device will lock out, with the breakers and air-break switch open. The relay positively assures operation of circuit breakers and air-break switch under all conditions and in a mini-

(*Continued on page* 96)

Navigation Requirements Affect

Special conductors, sags, towers used to meet unique requirements of 220-kv tie

G. N. **DeCOWSKY**, Transmission Engineer, Philadelphia Electric Co, Philadelphia, Pa.



332-FT RIVER TOWERS are painted in alternating bands of international orange and white for the protection of planes at Philadelphia International Airport

ANCHOR TOWER FOUNDATIONS required approximately 60 tons of reinforcing rods; more than 850 cu yd of concrete were used in one monolithic pour

Challenging air and river navigation requirements resulted in a unique design for the Philadelphia Electric Co-Atlantic City Electric Co 220-kv line across the Delaware River south of Philadelphia. Special towers, conductors, and foundations were built to meet the necessities of a busy location. The line is expected to go into service late this year with initial operation at 132 kv.

The crossing, about 6 miles from Philadelphia International Airport, spans the Delaware at a point where it is 4,200 ft wide. An anchorage area is adjacent to the New Jersey side of the 800-ft channel.

Because of the proximity of the airport, the height of the towers had to be lower than elevation 350 ft. In addition, a clearance of 208 ft above mean high water was necessary over the channel for river traffic. With 25 ft between the conductors and ground wires on the towers, this left only 110 ft for sag in the conductors.

In view of the difficulties presented by an aerial crossing, submarine cable was considered but discarded. The rock river bottom required expensive excavation, increasing cost prohibitively. Furthermore, 220-kv cable with high current-carrying capacity was not considered advanced enough in design.

With strict limitations on design, the crossing uses three spans, with two anchor towers each 150 ft high on shore and two 332-ft suspension towers in the river, instead of a single span. The suspension tower on the Pennsylvania side is located in the river between the bulkhead and the pierhead line. On the New Jersey side it was permissible to erect the tower 600 ft from the channel and 400 ft from a nearby anchorage,

Delaware River Crossing Design

which placed it 1,000 ft from the shore in water about 25 ft deep. This resulted in spans of 1,730, 2,754, and 1,100 ft.

The conductor consists of 61 strands of galvanized steel wires each 0.097 in. dia covered with 54 strands of aluminum wires each 0.1256 in. dia, resulting in an 851,870-cm ACSR cable. The conductor has a diameter of 1.382 in. and a breaking strength of 92,000 lb.

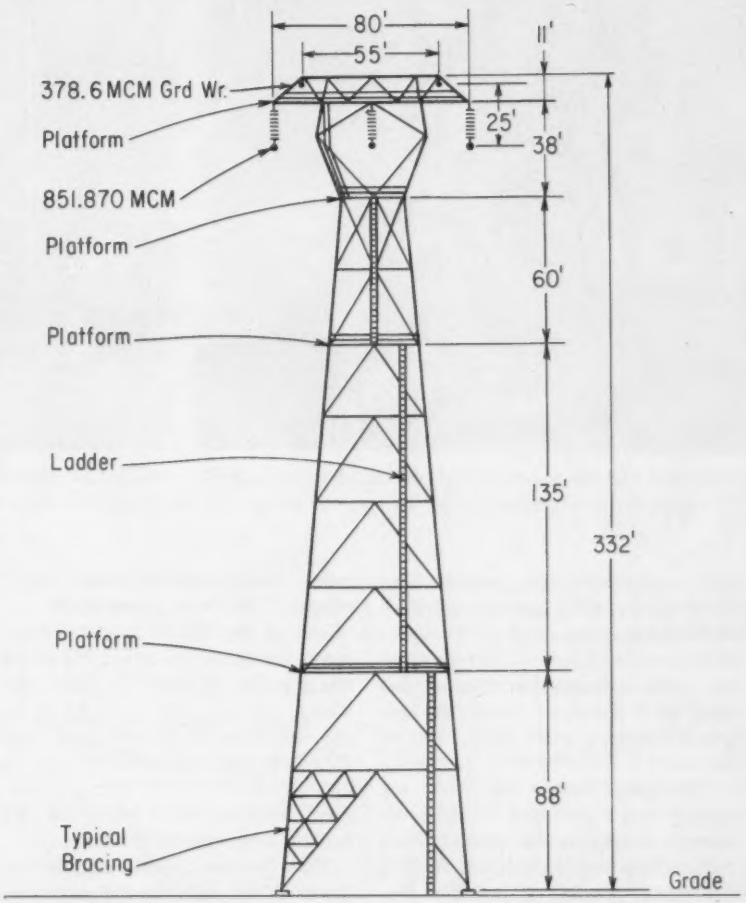
The ground wire has a single layer of 24 strands of aluminum over a steel core of the same stranding as the conductor, resulting in an overall diameter of 1.130 in. Because of the single layer, a Class C (heavy) zinc coating was used on the steel core wires as a protection against corrosion. This heavy coating reduces the steel size and hence the tensile strength of the core wire. To compensate for this strength reduction, a high tensile strength steel strand was used. The ground wire has a breaking strength of 83,000 lb.

Both the conductor and ground wire will be loaded to about 50% of breaking strength, 44,300 lb and 41,000 lb respectively, under the maximum design loading of 1 in. of radial ice with an 8 lb per sq ft wind load at zero F. The height of the towers and the importance of the line determined the severe design loading conditions.

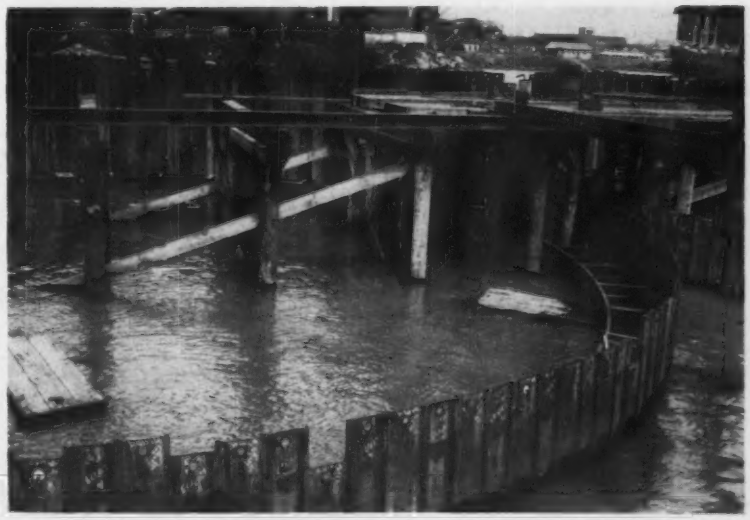
Cables were strung under a tension of about 15,000 lb for the conductors and 10,000 lb for ground wires to keep wires at least 150 ft above the river during stringing. Ground wire and conductors were shipped in predetermined span lengths, and all dead-ends were factory applied.

Phase wires are dead-ended on a plate which is supported on four insulator strings rated for 100,000 lb. All steel hardware was tested and magnafluxed before installation. Because standard compression fittings would not take the load involved, ⅞-in. zinc rope sockets dead-end the conductor at each tower. Stockbridge dampers have been installed, and vibration will be studied.

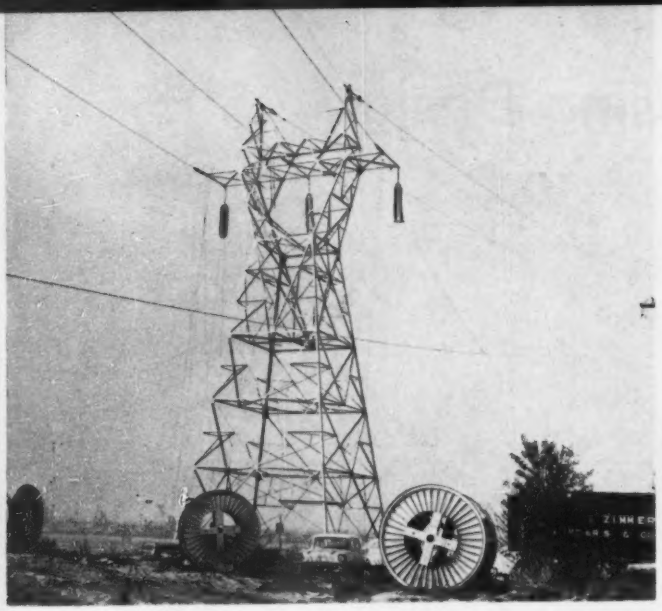
Height restrictions prevented the use of a standard yoke on the ground



CROSS-SECTIONAL VIEW of river tower shows three platform levels for ease of maintenance. An elevator runs up one leg of the tower to the highest platform



RIVER TOWER FOUNDATIONS consist of four interlocking circular steel cells (one for each leg) formed by driving sheet piles to a depth of from 50-80 ft



ANCHOR TOWER is 150 ft high and is set on river bank. Photos shown were taken during stringing of phase wires

ACSR CONDUCTOR consisting of 61 steel strands and 54 strands of aluminum requires support while stringing

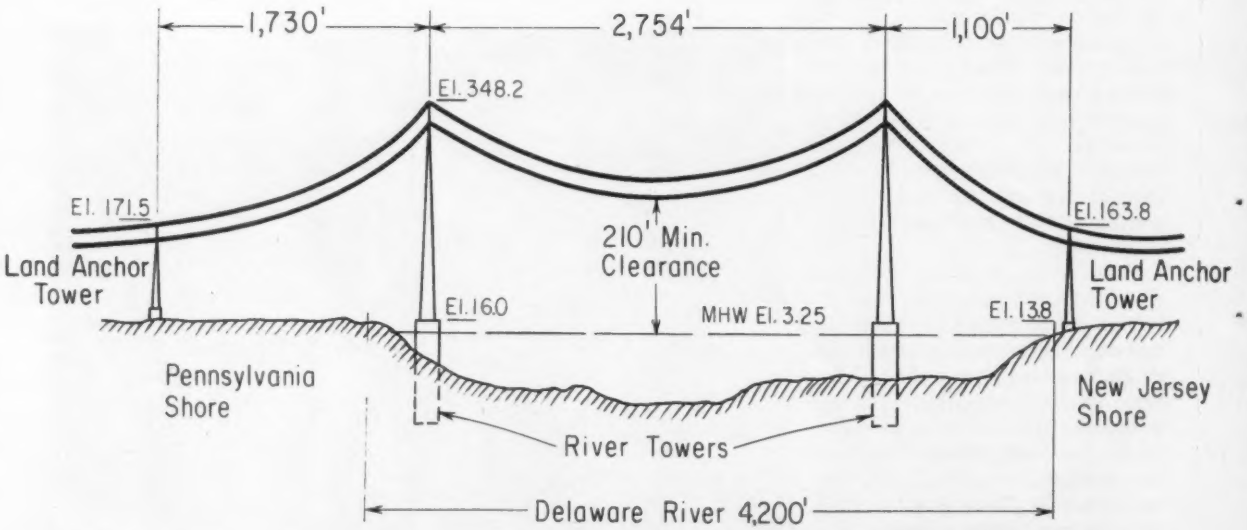
wire to insulate the ground wire from the tower for lighting and sleet melting purposes. A 15-in. compression cone insulator of the type used on radio transmission towers was used in a dead-end assembly suspended from a plate at the top of the tower.

The tower design does not vary greatly from standard designs, although boxing in the ground wires reduced the required height. A 40-ft horizontal spacing is provided between phases, and the ground wire is placed 25 ft above phase wires.

Design criteria allowed for wind strengths on the tower normal to the tower of 25 psf from 0 to 29 ft elevation, 30 psf from 30 to 49 ft, 35 psf from 50 to 99 ft, and 45 psf from 100 ft to the top of the tower on 1½ times the projected area of one face. Provision was made for one broken conductor in the design.

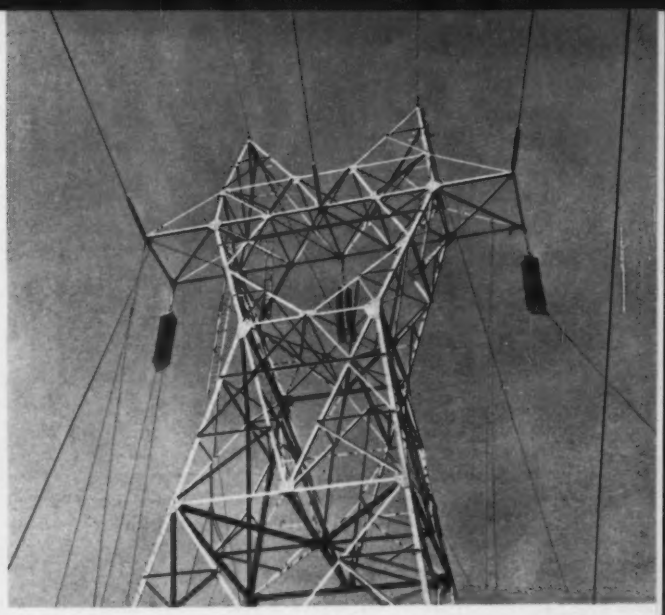
Two types of massive foundations are used, but each has the same support system consisting of four or more H-beam steel piles on each tower leg. These are driven to 50 to 100-ft depths through silt, sand, gravel and mica schist to bearing of 90 tons each.

On the anchor towers, the legs were capped and tied together with reinforced concrete beams of sufficient mass to provide uplift of about 500 Kips per leg. Approximately 60 tons of reinforcing rods and more than 850 cu yd of concrete were



THREE SPANS of varying lengths make up the crossing. Cables were strung at tensions of about 15,000 lb for conductors and about 10,000 lb for ground wires to keep wires at least 150 ft above the river during stringing

ARMOR ROD is applied during stringing. Conductors were shipped in predetermined lengths with dead-ends applied



DEAD-END INSULATORS await phase conductors. Ground wires were already in place when photo was taken

used on each anchor tower in a monolithic pour. Eight 2-in. anchor bolts are used for each tower leg. Despite the size of the anchor towers, conventional construction equipment and procedures were employed.

River tower construction consists of four circular cells (one for each leg) of approximately 67 ft dia obtained by driving interlocking sheet piles to a depth of from 50-80 ft. Separate cells were utilized to avoid damage to the entire foundation should a sheet be broken. The cells are tied together to form one unit.

A platform about 15 ft above water was built by driving clusters of wood piles in the center of each cell. This permitted the use of more readily available and economical land cranes in setting sheet piles, rather than attempting to work from barges. Steel templates of 66 ft dia were fabricated and placed in each cell to get accurate setting of sheet piles and to avoid collapsing of the cell before the fill was placed. One template was placed just above water and the other about 15 ft above water.

Upon completion, the cells were filled hydraulically with selected sand and gravel pumped from the river bottom. The bearing piles were then driven, capped and tied together with reinforced concrete. About 130 tons of bearing piles, 2,000 tons of sheet piling, 50 tons of reinforcing steel, 600 cu yd of concrete and 70,000 cu yd of sand and gravel fill were required for the two river tower foundations.

Cathodic Protection Provided

Because the foundations are located in a corrosive environment, a cathodic protection system of long-life sacrificial anodes has been installed at each foundation to protect bearing piles. On the anchor towers, there are nine anodes around the periphery of the foundations. On the river towers, there are three anodes inside each cell. To reduce the current requirements, the H-beam piles for the river towers were given a coal tar coating modified with epoxy resin. Each tower foundation requires from 6 to 18 amp for adequate corrosion protection.

River navigation protection is provided by red lamps on the river tower foundations. In addition, a foghorn with a half-mile range has been installed on the New Jersey foundation because of its proximity to an anchorage area and dock of the Chester-Bridgeport ferry. The horn operates continuously on a 2-sec sound and 18-sec silent cycle.

For air navigation, each of the two high suspension towers is painted in alternate bands of international orange and white for daylight visibility, and each has fixed red lights at two levels and a flashing red beacon at the top. There are 16 daylight marking spheres and 16 lights on the wires at intervals of about 300 ft.

Lights are of the current transformer type, energized by current in the wire on which they are clamped. The lights on the conductors will be lit whenever current is passing. The three spans of the ground wires will be insulated to permit the circulation of current through them from an independent source. The lights are energized from an independent source. Because of the importance of the crossing, provisions are made to increase circulating current when necessary to prevent ice formation.

A two-man cable car was devised to use for maintenance and inspection of the lights on conductors and ground wires. A track-mounted crane, placed on the crossarm level of the tower, lowers the cable car onto any of the conductors. A separate winch on the crane is used to retrieve the car when work is completed. A cable car is kept in each river tower, and each can be used to the low point of the catenary about half-way across the river.

Access is provided by both an elevator and an enclosed ladder. The elevator runs up one of the tower legs. Gratings and hand rails at several elevations reduce the possibility of accidents.

Canopy-Scaffold Aids Furnace Work

V. E. HUCK, Maintenance Man, Muskingum River Plant, Ohio Power Co, Beverly, Ohio—AEP System

A special canopy-scaffold at Ohio Power Company's Muskingum River Plant makes inside furnace work safer, easier and faster. Two to four men now safely do the work originally accomplished by six to eight men—and without aching arches at that. The sectionalized design makes it easy to install or remove the protective assembly.

Personnel working inside the furnace area exposed to falling material—small pieces and areas of slag, present on the wall and roof surfaces, can drop at any time. Also, when changing deflector blocks and tube protectors, especially on the second row of burners, a worker must operate from a ladder—a tiring routine.

The canopy-scaffold consists essentially of a plywood platform on which to stand, and another piece to serve as a shelter above the work platform. The plywood shelter or canopy deflects falling slag away from the working platform below. The canopy consists of two pieces of ¾-in. plywood, one 2x8 ft, and the other 1x8 ft. Both can be brought into the furnace area through the furnace door.

The scaffold is built around an 8-ft length of angle iron across its front. Near the two ends of this angle iron notches were cut to maintain a 7-ft

spacing for the two brackets. Three, or even four, rather than two brackets, could be used to increase the safety factor if desired. A 2x8-ft sheet of ¾-in. plywood is used for the floor of the scaffold.

The brackets for both canopy and scaffold extend 2 ft 4 in. from the furnace wall. The angles used give a 2 ft 6 in. lower leg on the scaffold bracket and a 3 ft upper leg for the canopy. The canopy and scaffold are each supported by the two end brackets made from ¾-in. pipe bent to convenient angles. The upper ends of these pipe brackets were flattened and bent to a U-shape that fits around the furnace wall tubes for solid support. The lower ends of the brackets contain a flat plate that rests against the boiler tube. The bracing and the support plates are made of ½x2-in. strap steel.

Legs on Pump Cure Clogging

J. W. MURRAY, Distribution Engineer, Southwestern Electric Power Co, Shreveport, Louisiana

Supporting the sump pump on three legs eliminates the clogging of pump impellers caused by silt and gravel. While labor, repair, and maintenance time saved is significant, of greater importance is the dependable operation now achieved.

The legs support the pump approximately 7 in. from the bottom of the sump—7 in. of sump water is permissible. Actually, the pump was originally supported on three short nubs; however, these did not give the pump suction sufficient clearance on the silt and gravel.

With General Electric Network Transformers

High vault temperature or heavy loads no threat

Permalex* transformers permit continuous operation at 100% of rating in 50 C vaults or 112% of rating in 40 C vaults

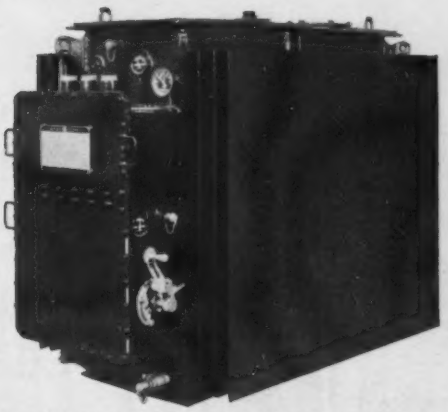
The new 55° ● 65° Permalex transformer insulation system provided in General Electric network units assures maximum reliability, regardless of today's heavy loads or high vault ambient temperatures.

A 12-percent increase over standard kva continuous loading may be obtained in a standard 40 C maximum vault ambient with the 65 C rating. Or the transformer may be operated continuously at the standard 55 C rating in a 50 C maximum vault ambient. In either case, the maximum hottest spot temperature would not exceed 115 C which, with Permalex transformers, permits continuous operation at rated kva *without loss of normal life expectancy.*

Always specify "Permalex network transformers" to get this added reliability and built-in money-saving loading capability.

Ask your General Electric Sales Engineer for more information about Permalex transformers as well as other outstanding G-E network transformer features. Or write to Section 484–02, General Electric Co., Schenectady, N. Y.

** Registered trade-mark of General Electric Company.*



General Electric Permalex network transformers may be operated at 112 percent of rated load in a maximum vault ambient temperature of 40 C, or they may be operated at 100 percent of rated kva in higher temperatures (up to 50 C maximum vault ambient).

Progress Is Our Most Important Product

GENERAL ELECTRIC

Smaller, Lighter, More Efficient Transmission-tie Power Transformers

Specify General Electric bushing-mounted LTC and eliminate the extra, series transformer in units 120,000-kva and above

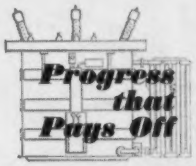
Power transformers which are up to 10% lighter and smaller, and have as much as 15% lower losses are available for your transmission-tie applications, 120,000-kva and larger, above 69 kv. These smaller, lighter, more efficient General Electric units utilize bushing-mounted load-tap-changing (LTC) equipment.

Conventional, large LTC equipment normally requires an auxiliary, series transformer next to the main core and coils to reduce insulation requirements. Locating the load tap changers atop the bushings means the series transformer, with its size, weight and losses, can be eliminated.

NEW TREND?

The first General Electric bushing-mounted load tap changers were installed in 1943. However, since 1957, 21 G-E power transformers with these load tap changers have been delivered or ordered. Units rated 300,000 kva are in service; others rated 345 kv are being built.

FOR MORE INFORMATION about General Electric bushing-mounted load tap changers, contact your G-E sales engineer. Or, write for Bulletin GEA-7133, to General Electric Company, Section 421-60, Schenectady 5, N.Y.

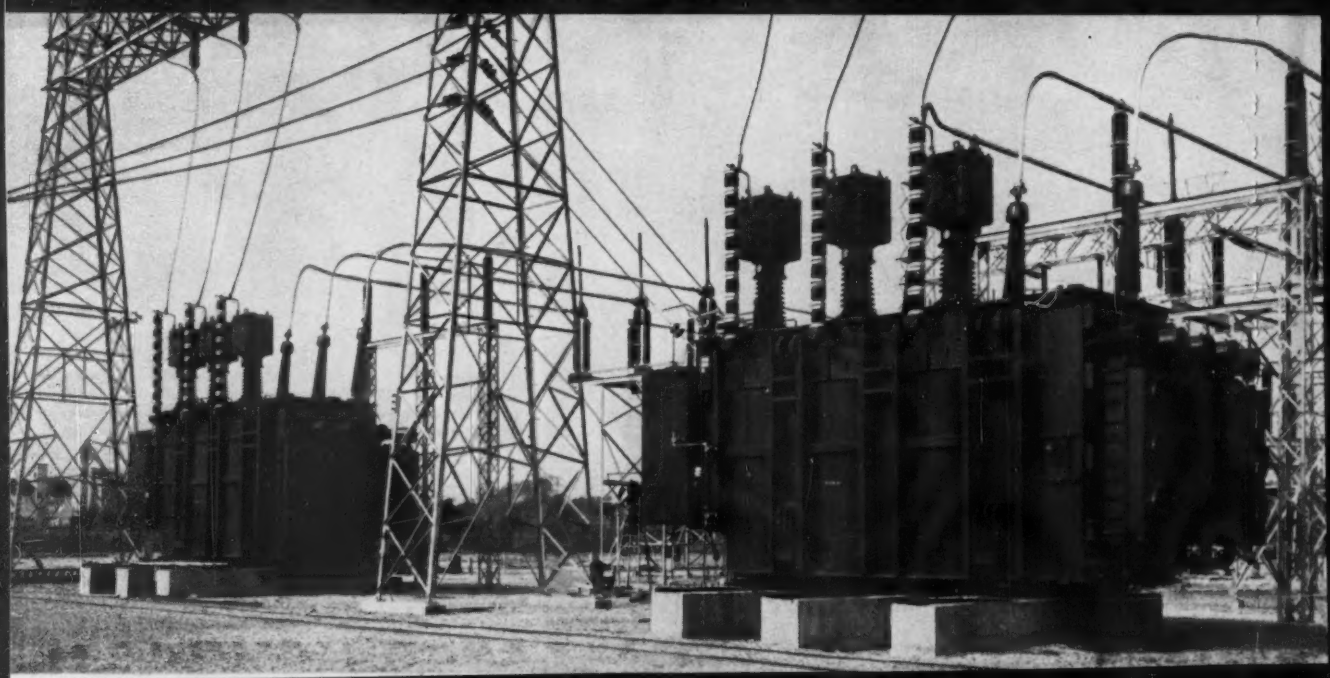


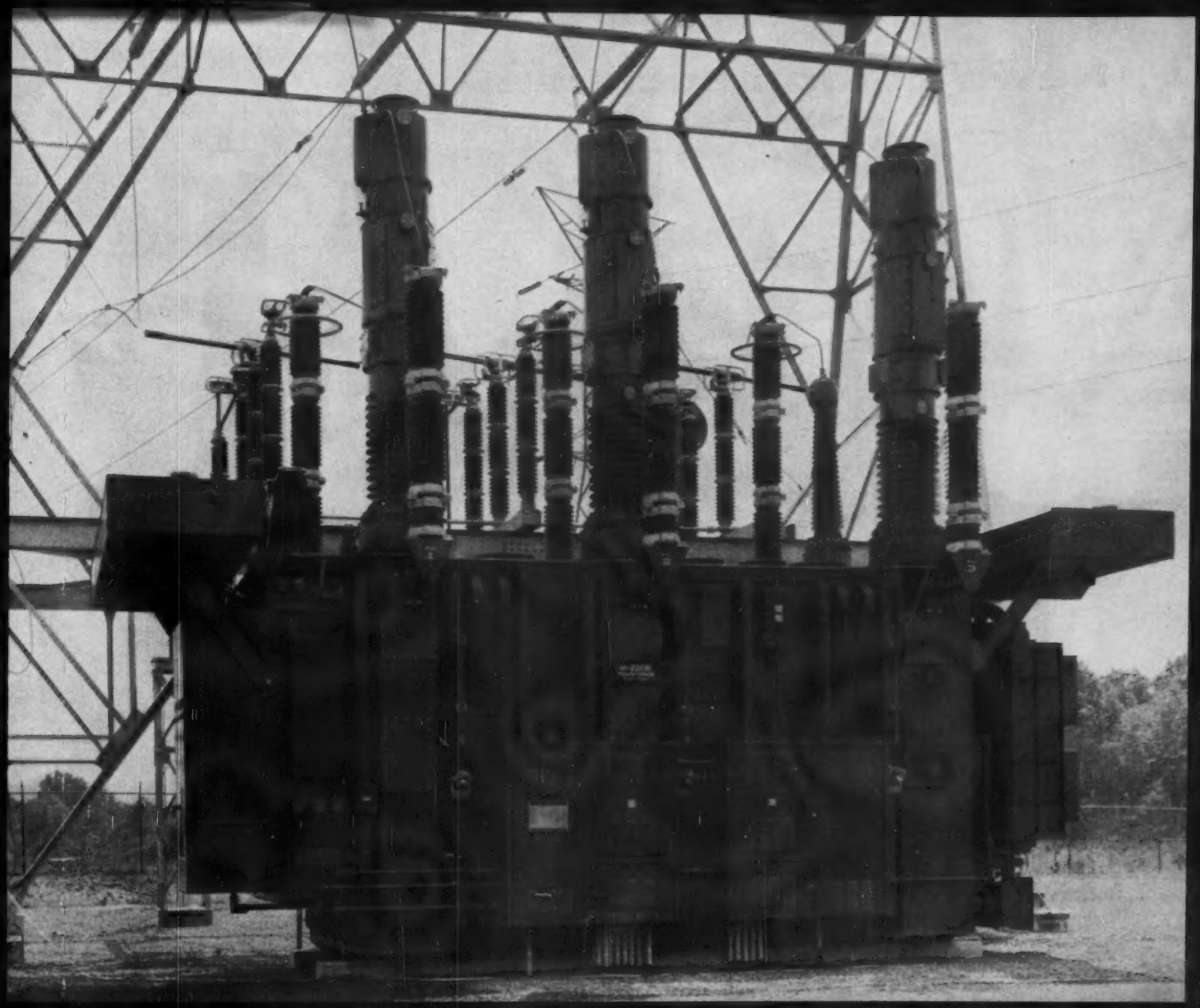
Progress Is Our Most Important Product

GENERAL ELECTRIC

Higher-rated transformers—such as this 300,000 (output)-kva, 230-kv unit at the Trenton Switching Station of the Public Service Electric and Gas Co., N. J.—utilize the LR-41 LTC mechanism.

The medium-duty General Electric LR-69 bushing-mounted load-tap-changing mechanism is used on these 125,000 (output)-kva, 230-kv transformers at the Gardenville substation of the Niagara-Mohawk Power Corp.

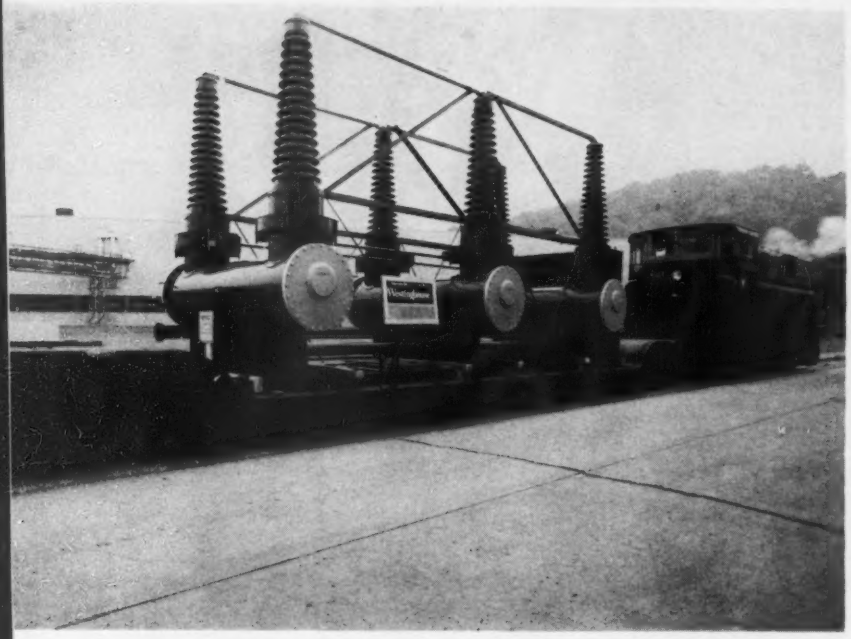


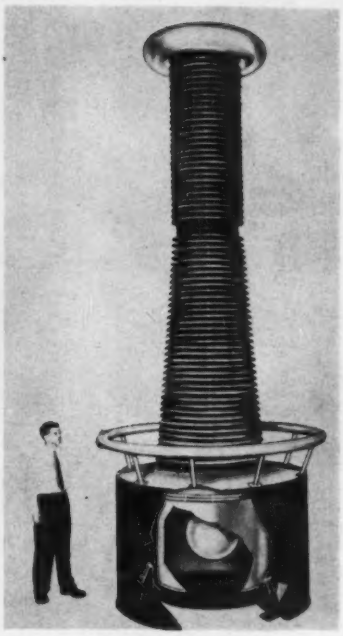


TYPICAL SAVINGS WITH BUSHING-MOUNTED LTC

	CONVENTIONAL LTC	BUSHING-MOUNTED LTC
Rating: FOA-T-60-250,000 (output) kva-230 kv-115 kv		
LENGTH	450 INCHES	410 INCHES
WIDTH	295 INCHES	300 INCHES
WEIGHT	521,000 POUNDS	488,000 POUNDS
TOTAL LOSS	820 KW	736 KW
Rating: FOA-T-60-200,000 (output) kva-345 kv-115 kv		
LENGTH	485 INCHES	435 INCHES
WIDTH	340 INCHES	340 INCHES
WEIGHT	650,000 POUNDS	595,000 POUNDS
TOTAL LOSS	975 KW	837 KW

News of Manufacturers





Sulphur hexafluoride insulates PP&L's breaker, Project EHV test capacitors as . . .

Interest Is Shown in SF6 for Equipment

• Due to its "interest in advancing the art of oilless circuit breakers," Pennsylvania Power & Light Co worked with Westinghouse Electric Corp on the design and development of this 230-kv, 15,000-Mva, 1,600-amp circuit breaker (abv, lft). It is the first such unit of this capacity using sulphur hexafluoride as the interrupting medium.

Breaker, shown being shipped completely assembled, has since been installed as one of two breakers protecting 45 miles of circuits connecting PP&L's Brunner Island Station with West Shore and South Akron substations.

• Canadian General Electric Co designed and built three 650-kv sulphur-hexafluoride-filled capacitors (see drawing abv, rt) for General Electric Co's Project EHV, near Pittsfield, Mass. One unit will be used for each phase of the prototype transmission system, measuring line voltages from 380 to 750 kv. Capacitors will withstand lightning surges up to 2,050 kv.

The sphere in the center of the SF_6-filled chamber is at line potential; voltage is measured across the small electrode gap in the sphere-to-ground field. Highly accurate voltage measurements can be obtained, says GE, due to negligible loss and few phase-angle errors.

French Steam Plant Joins Automation Parade

A steam generating plant to be built at Saint Ouen, France, will be the first such large plant outside the US to use integrated automation. Electricite de France, government-owned utility, has bought two RW-300 digital control computer systems from CAE, Compagnie Europeenne d'Automatisme Electronique. CAE was formed by Thompson Ramo Wooldridge Inc, and two French electronic firms last July to make and sell the RW-300 system in the European Common Market.

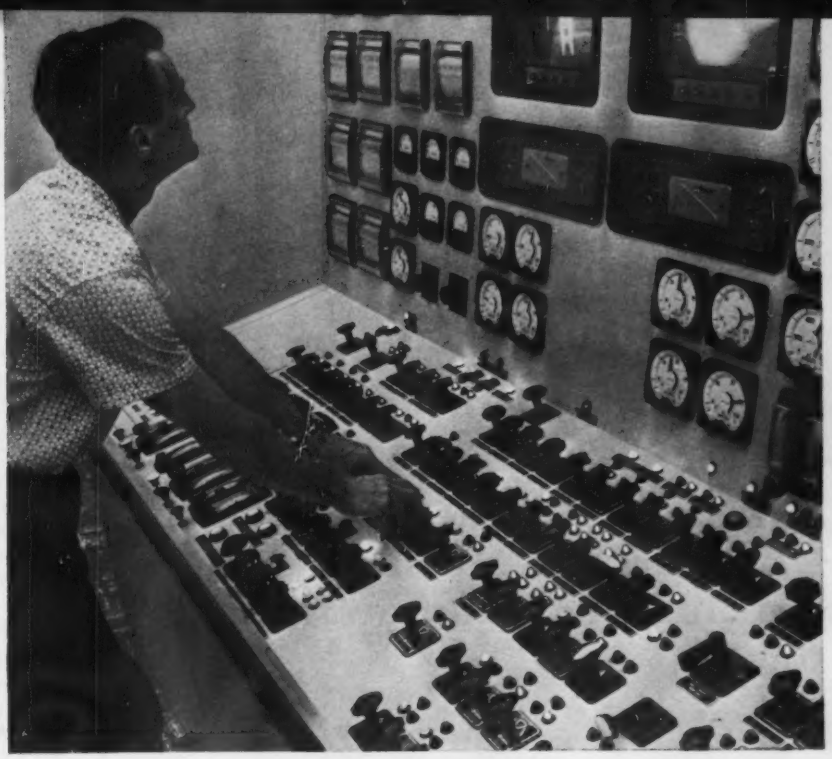
More than 600 process variables will be automatically recorded and monitored by the computers at Saint Ouen. They will also calculate and record theoretical and actual performance values, and control plant operation to give desired power output at minimum cost.

The RW-300 is a transistorized digital control computer for closed-loop control of full-scale manufacturing processes. The industrial computer division of Thompson Ramo Wooldridge, TRW Computers Co, provides marketing, systems engineering, installation and maintenance service of RW-300s in the United States.

RW-300 computers are also used by the utility to detect ruptures in nuclear reactor fuel cases.

(*More News of Manufacturers, p* 66)

Control boards at the Gulf States Utilities Company's Roy S. Nelson Station, near Lake Charles, Louisana.



Using compact General Electric SBM Switches, Stone & Webster Engineering Corp. installs . . .

3 control boards in the space of 2

. . . for Gulf States Utilities Company

Control board space requirements reduced one third—that's what Gulf States Utilities Company achieved at its Willow Glen and Roy S. Nelson Stations using compact General Electric SBM transfer and control switches.

The Stone & Webster Engineering Corporation designed and built the stations for Gulf States, and recommended G-E SBM switches because of their small panel mounting dimensions (2½ inches high by 2⅝ inches wide), and wide versatility of contact arrangements.

FRONT VIEW

SIDE VIEW

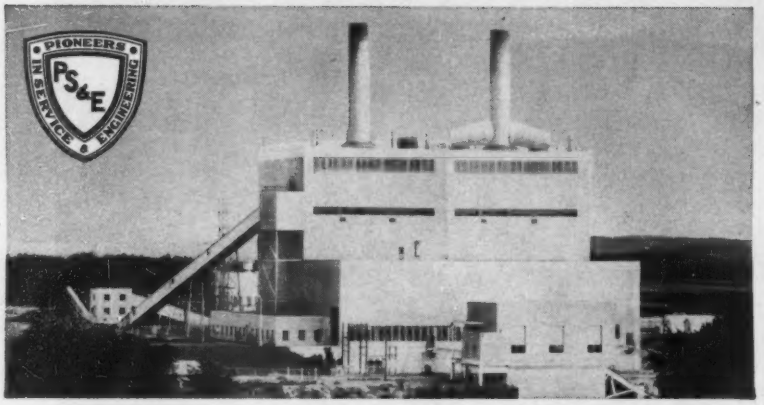
The SBM switch has one to 10 stages, with two electrically separate and mechanically independent contacts per stage. For field modifications, an "add-a-stage" feature permits two additional stages to be coupled to the rear of existing switches with one to eight stages.

Electrical rating of the SBM switch is 300 volts a-c or d-c, 20 amps continuous. Increased interrupting rating permits a wide range of applications.

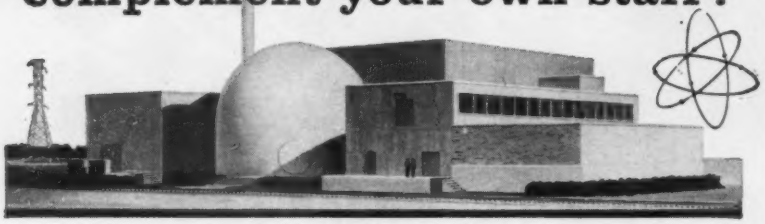
Ask your G-E Sales Engineer how *you* can save valuable control room space using this compact, versatile switch. Or write to Section 534-02, General Electric Company, Schenectady 5, N. Y., for Bulletin GEA-4746D.

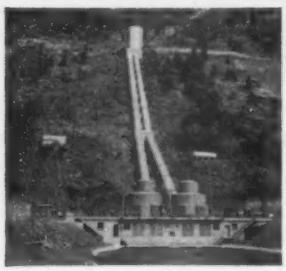
Progress Is Our Most Important Product

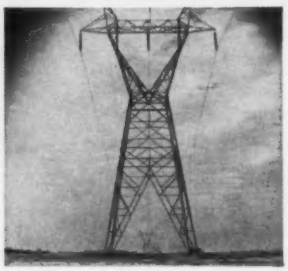
GENERAL ELECTRIC



Which Pioneer service do you need to complement your own staff?







DESIGN AND CONSULTING ENGINEERING SERVICES

Pioneer specializes in designing power plants and offers design service for fossil fuel, hydro and atomic plants. It will also assist in forecasting load growth, in site selection, in purchasing and expediting of equipment and construction management. Pioneer's other services include substation, transmission and distribution studies and design.

SERVICES IN REGULATORY MATTERS

Pioneer offers its services in all phases of Federal, State and local utility regulation, including natural gas and electric rate matters, certificate proceedings, licensed project accounting requirements, depreciation studies for rate case and income tax purposes, cost allocations and special studies.

CORPORATE SERVICES

Pioneer offers its services as business and management consultants; stock transfer and dividend disbursing agents; financial, accounting and tax consultants.

Write for Booklet "PIONEERING NEW HORIZONS IN POWER"

Serving Electric Utilities and Industrial Power Users Since 1902

Pioneer Service & Engineering Co.

231 SOUTH LA SALLE STREET • CHICAGO 4, ILLINOIS

EHV Cable Insulation Materials, Tests Outlined

The publication, "Symposium on High-Voltage Cable Insulation—STP 253," places emphasis on requirements for materials which should be used; their proper application; and test methods which reveal capabilities and faults of insulation systems used for EHV transmission. It is issued, says the American Society for Testing Materials, in recognition of utilities' needs to use ever-higher-capacity power cables and the need of cable makers for guidance in producing these cables.

Jointly sponsored by the American Institute of Electrical Engineers' Subcommittee on Insulated conductors and the ASTM Committee D27 on Electrical Insulating Liquids and Gases, the book is the eighth of a series on insulating oils. It may be obtained from ASTM Headquarters, 1916 Race St, Philadelphia 3, Pa, for $1.50.

MANUFACTURERS BRIEFS

• Production at **Triangle Conduit & Cable Co's** recently completed bituminous fiber products plant at Landisville, N. J., marks company's entrance into the fiber conduit field. New facilities also house the Plastic Pipe Div.

• **York-Hoover Corp's Body Div,** York, Pa., has been purchased by Twin Coach Co, Buffalo, N. Y., to be operated as a subsidiary, as the York Body & Equipment Co.

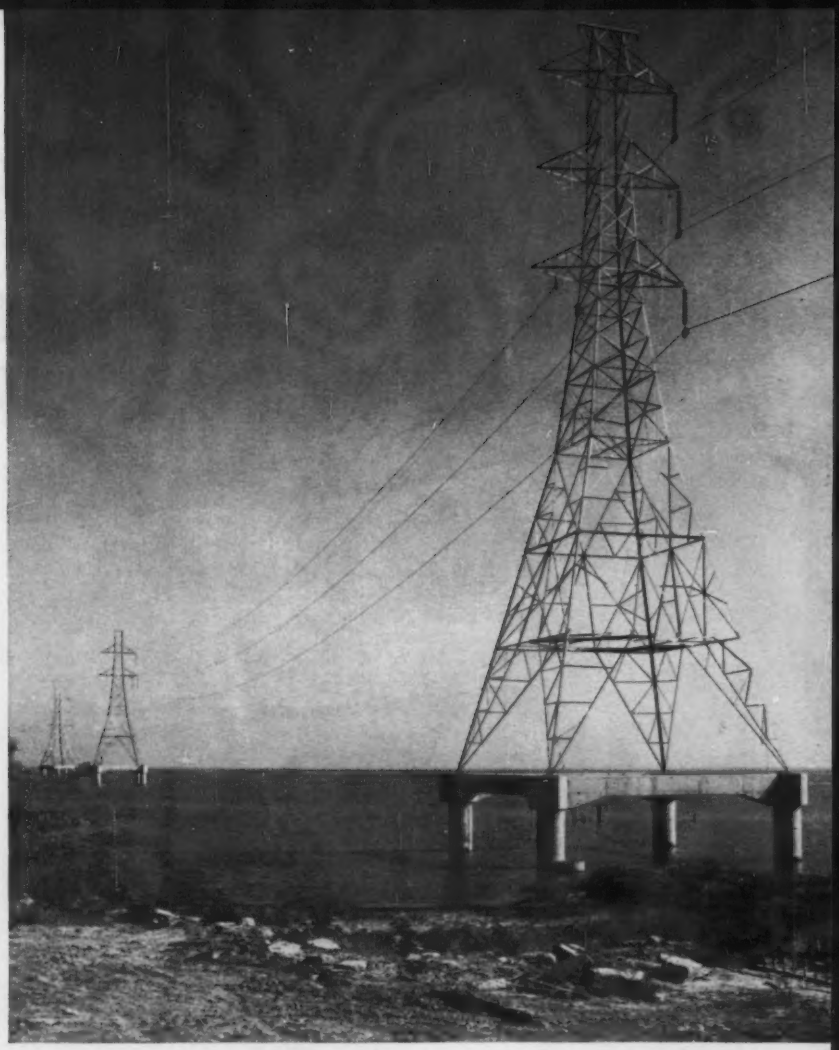
• **Westinghouse Electric Corp's** third-quarter report showed net income of $20,226,000, down 8.4% from same period last year. Net sales billed were $503,389,000, up 2%. Decline in earnings on higher sales was attributed to "reduced sales volume and prices of consumer products and by a general easing of prices for other products."

• **Power Piping Div of M. W. Kellogg Co,** subsidiary of Pullman Inc, is producing products for the electric, nuclear power and process industries at its new Williamsport, Pa., plant. The $4-million facilities include a manufacturing plant with

(*Continued on page* 71)

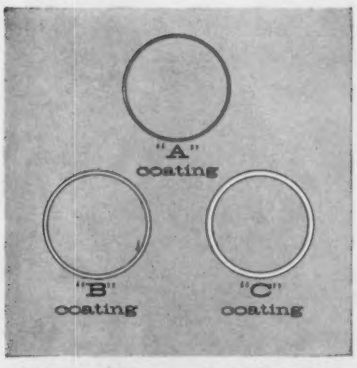
Steel

For strength
... economy
... versatility



BETHLEHEM ACSR CORE WIRE

...steel backbone for high-tension conductors



Bethanized ACSR core wire is available in 3 coating weights.

Bethlehem ACSR core wire gives these high-tension wires the strength of steel they need for long spans. And that strength also helps them to hold up in stiff winds and ice storms.

Stranded about standard aluminum electrical conductors, Bethlehem ACSR core wire has a time-tested zinc coating that assures trouble-free stranding. Our unique electrolytic process, called bethanizing, bonds virtually pure zinc on the steel wire . . . smoothly and uniformly for long-lasting corrosion resistance.

Three bethanized coating weights are available: standard (A), heavy (B), and extra heavy (C). All three are furnished in sizes from 0.1879-in. to 0.0525-in.

Just a phone call will put you in touch with a Bethlehem sales office. Or write to us at Bethlehem, Pa., for further information on ACSR core wire or other grades of steel wire.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Sales: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

PENNSYLVANIA INTRODUCES THE

Loadmaster...

100

...to Give You Full Circuit Protection at up to 30% Less Cost

*Patents applied for

• 600-volt fused interrupter switch

The new Loadmaster 100*—another first from Pennsylvania—is a 600-volt load interrupter *specifically designed* to employ new current-limiting fuses in drawout switchgear. It combines the economy of a fused interrupter switch with the basic functions of a circuit breaker.

The Loadmaster 100:

Provides full overload protection with new Buss Low-Peak dual-element fuses

Provides complete major fault protection with current-limiting action within one-half cycle

Provides protection against single-phasing

Provides fully-rated systems at the price of cascaded systems

Extends economically the range of substation capacities . . . all this at a considerable savings in equipment cost—the exact amount of savings depending upon the particular application.

Complete Primary and Feeder Coordination

Overload and fault protection with the Low-Peak fuses will coordinate both with primary fuse protection and individual load controls (see fuse coordination curves). In the overload region the Loadmaster has adequate time delay, while under fault conditions the circuit is cleared well before peak current conditions are reached. A fault in any phase clears all three phases simultaneously, preventing single-phase operation.

Provides Fully-Rated System at No Increase in Cost

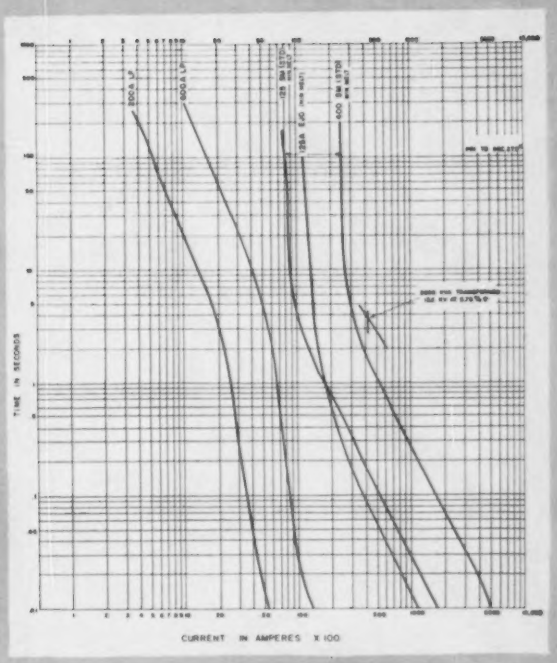
The Loadmaster 100 has an interrupting and close-in rating of 100,000 symmetrical amperes, confirmed by extensive tests at the Bussmann-Thos. A. Edison short-circuit laboratory. This rating makes it possible to provide the advantages of a fully-rated feeder system with the Loadmaster, at the cost of cascading.

More Kva per Dollar

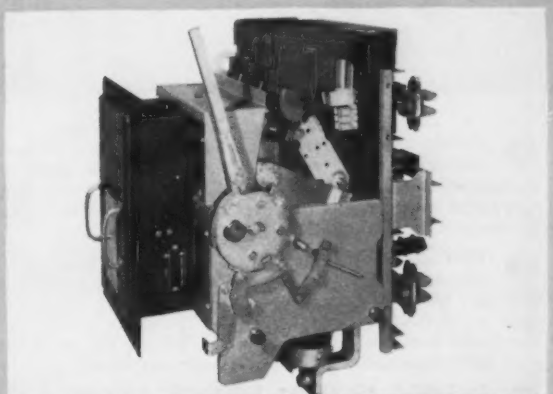
Larger substation ratings—at less dollar cost per kva—are possible with the new Loadmaster 100. Transformer cost per kva becomes less as the rating increases. Since the standard Loadmaster 100 can replace the large-frame circuit breakers required in systems capable of delivering up to 100,000 amperes, the often prohibitive switchgear cost involved in large substations is eliminated.

Other outstanding features of Loadmaster 100:

- Electrically-operated spring-charged close and trip
- Remote close and trip control
- Blade-type contacts which eliminate bounce
- No live parts on switch front—integrally-mounted fuses requires complete disconnecting from energized bus before inspection and replacement



Overload and fault coordination provided by the Loadmaster 100 are shown by the time-current values for 200-ampere and 600-ampere Low-Peak fuses (left). Low-voltage fuses are readily coordinated with transformer primary protective devices (right).



Side view of the Loadmaster 100 shows blade-type contacts. Phase barriers and arc chute at right have been removed.

Pennsylvania Unit Substations

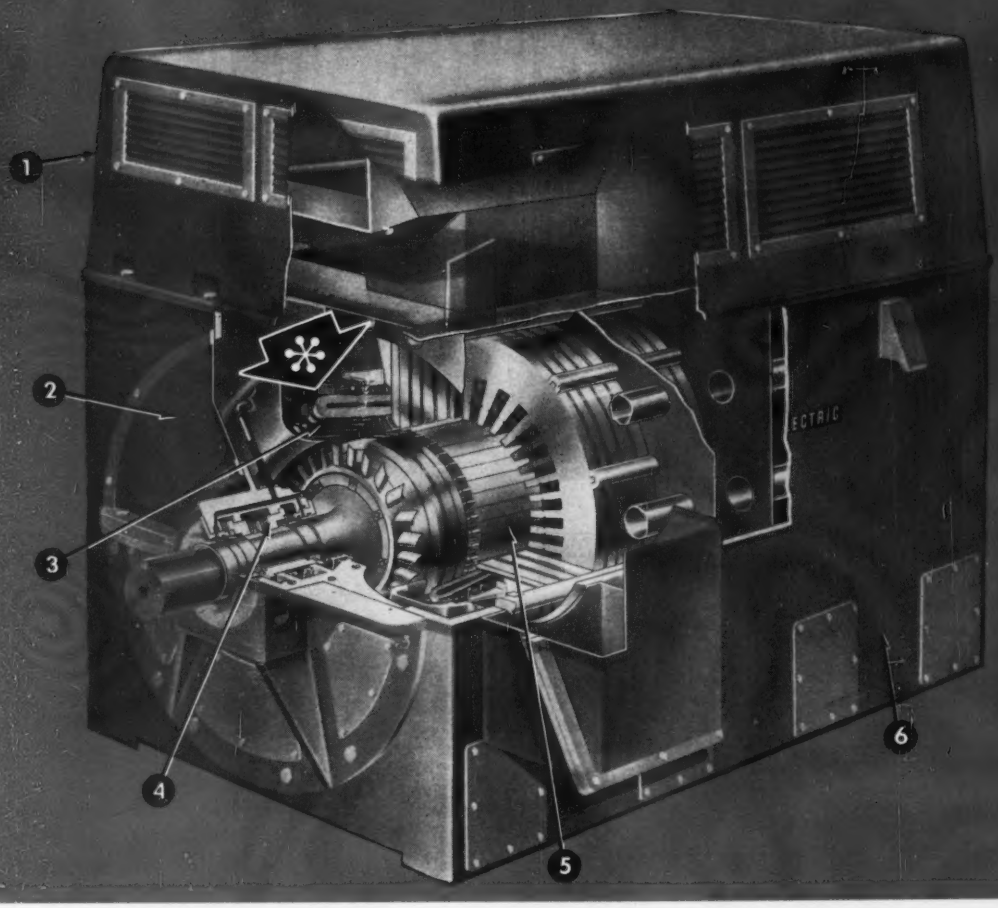
PENNSYLVANIA TRANSFORMER DIVISION

McGRAW-EDISON COMPANY · CANONSBURG, PENNSYLVANIA

over 31 years' experience . . . builders of transformers from 5 to 500,000 kva; 24 to 460 kv

NEW General Electric CUSTOM '8000' Boiler Feed Pump Motors . . .

CUSTOM DESIGNED FOR POWER STATION APPLICATIONS



1 **REMOVABLE "TOP-HAT"** provides easy access to motor interior. Top-hat is baffled and lined with sound absorbing materials to attenuate motor operating noise. Rotor and stator are constructed to reduce noise and direct sound waves into the acoustically treated top hat.

2 **NEW END SHIELD DESIGN** reduces time required for inspection and maintenance. One man can quickly unbolt and lift off the upper end shield half and remove the split air deflector. Bearing support is integrally cast with the lower end shield. Lower half of bearing can be "rolled out" for inspection without removing end shield.

3 **EXCLUSIVE POLYSEAL* SUPPORTED SILICONE RUBBER INSULATION SYSTEM** provides superior mechanical, thermal, voltage and environmental endurance—affords top reliability in critical Electric Utility applications.

4 **TRIPLE PROTECTED BEARING SYSTEM** lengthens boiler feed pump motor life. A primary seal is formed by the ring mounted on each end of the bearing shell and adjacent oil slinger machined in the shaft. A multiple groove seal at each end of bearing housing acts as a second line of defense against dirt entrance and oil leakage. In addition to the slingers and close running labyrinth seals, G.E.'s new bearing system utilizes an *Air-Lock* seal in each bearing housing. Air at slightly higher than atmospheric pressure is piped to annular grooves at each end of the bearing. This air pressure acts as a third seal to keep oil locked in the bearing housing.

5 **ROTOR PARTS ARE MACHINED TO PRECISION TOLERANCES** and assembled using especially developed techniques to assure high-speed operational stability.

6 **RUGGED FRAME ASSURES SOLID STRUCTURAL SUPPORT** for stator, end shields, rotor and top-hat. Frame is precision machined to positively align motor parts.

GENERAL ELECTRIC'S "CUSTOMIZED" MOTOR manufacturing philosophy permits the design flexibility, and the adherence to quality control production standards, which assure Electric Utilities of optimum motor performance, reduced operating costs and lower first cost. In keeping with requirements of Electric Utilities, Custom '8000' boiler feed pump motors are available now in ratings to 10,000-hp. 883-01

* Trade-mark of General Electric Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC

NEW

encapsulated connection harness increases mechanical strength, assures maximum motor reliability

General Electric's new encapsulated connection harness consists of two rings of insulated conductors encapsulated in epoxy resins. The larger ring contains motor leads and phase connections, while the smaller ring contains equalizer connections.

This new system provides greater strength and rigidity at the end turns and assures uniform coil connections. Rigid encapsulation prevents contact between conductors—eliminates insulation abrasion. The epoxy compound provides additional insulation for leads and connections.

NEW ENCAPSULATED CONNECTION HARNESS for General Electric boiler feed pump motors provides an immobilized connection bundle . . . eliminates loose ties and abraided insulation.

YOUR GENERAL ELECTRIC APPARATUS SALES REPRESENTATIVE has full details on new G-E boiler feed pump motors. Call him today. Medium AC Motor & Generator Department, Schenectady 5, N.Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Manufacturers Briefs

(*Continued from page* 66)

raw-materials storage bay, truck port and railroad siding, metallurgical and welding laboratories, and office building.

• **De Laval Steam Turbine Co** has established two independent operating divisions, Machinery Div and Power Auxiliaries Div, to separate its larger custom-made products from its smaller standardized products. Further expansion of the former division is expected to include compatible products De Laval does not make now.

Manufacturers Literature

CONSTRUCTION . . . crawler-mounted Lorain Model 26. Details of machine's construction and job applications for use as shovel, crane, clamshell, dragline, hoe, log loader, pile driver and magnet. Bulletin No. 26751-0, 20 pages. Thew Shovel Co, Adv Dept, Lorain, Ohio.

CAPACITORS . . . for industrial use. Discussion of power factor, benefits of use, selection and application of units. Booklet B-7642, 12 pages. Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

PIPING . . . power and process systems. Case history studies of 17 power plants and 15 industrial plants, with photographs of exteriors and interiors, fabrication and erection details. Section on welding fittings and flanges. Bulletin 60B, 20 pages. Midwest Piping Co, Inc, 1450 South Second St, St. Louis 4, Mo.

THERMAL DEMAND METERS . . . standards on single range: 5, 10, 50, 100 and 200; dual range: 5-10, 50-100 and 100-200, 120, 240 and 480 v; 60 cycles. Nominal 15-min demand interval. Illustrations of internal wiring arrangements, typical scales. AEIC-EEI-NEMA Standards. EEI Pub No. MSJ-5; NEMA Pub No. EI 15-1960, 12 pages, 50¢. National Electrical Mfgr Assn, 155 East 44 St, NYC 17.

WIRE . . . Mechtron enameled, magnet and ultra-thin wall instrument wire. Specifications, dimensional data, properties. Catalog, eight pages. Mechtron Div, Tensolite Insulated Wire Co, 1000 N Division St, Peekskill, N. Y.

*Trademark

Fanner Superformed Products

"Superforms* help me insure Uninterrupted Service" ...TRANSMISSION ENGINEER

"Superforms help me accomplish my Number One Job Function:

"*Keeping millions of dollars worth of equipment in constant service for many thousands of customers.*"

Transmission Engineers not only must know the requirements for their lines . . . they must also see that they are met. And, they have found that Fanner Superformed products are always reliable.

A-1596A

FANNER Superformed with a "PROTECTIVE TWIST"

ARMOR RODS . . . Protect long-span T&D lines at supports

LINEGUARDS . . . Protect short-span T&D lines at supports

PATCH RODS . . . Repair damaged conductors

TAP ARMOR . . . Protects conductor at tapping points

FANNGRIPS . . . For dead-ending strands and conductors

FANNSPLICES . . . Join two ends of conductor wire

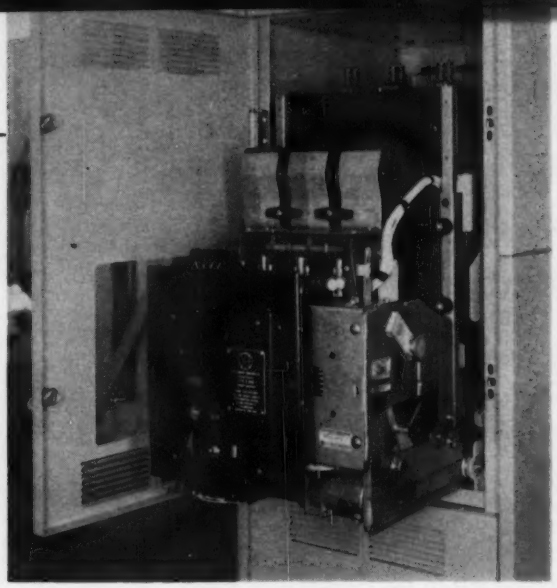
PLASTIC PRODUCTS . . . For conductor surface protection

FANNER

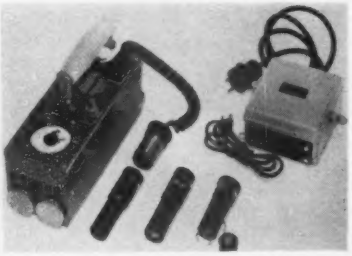
The Fanner Manufacturing Co.
Brookside Park—Cleveland 9, Ohio
Division of Textron, Inc.

New Equipment

Circuit Breaker . . .

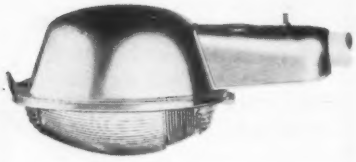


. . . with high-capacity fuses in combination interrupts 200,000 amp. The Amp-trap fuses, which are mounted in the same switchgear compartment, interrupt in less than a cycle. The breaker has an overcurrent trip device for lower fault currents. Single phasing is prevented by trigger fuses, one of which blows when its corresponding main blows and trips the breaker. The K-Don breaker for electrical or stored-energy operation is available in 600 and 1,600-amp frame sizes.
I-T-E Circuit Breaker Co, 1900 Hamilton St, Philadelphia, Pa.



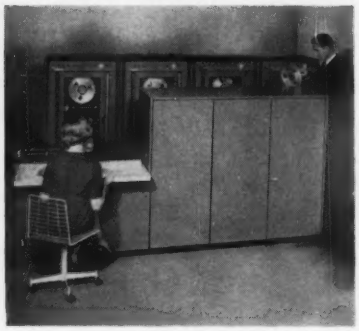
Radiation Meter . . .

. . . can be used for measurement of alpha, beta and gamma radiation. The portable radiation survey meter operates on two standard flashlight batteries and is stabilized for changes in voltage and temperature. It has a built-in loudspeaker and earphones and operates on ranges of 0-10 and 0-200 mr per hr.
Gelman Instrument Co, Chelsea, Mich.



Luminaire . . .

. . . for street lighting in residential areas and on secondary streets provides uniform, low-level lighting. The 2500 series Urbanoval is for 100, 175, or 250-w mercury lamps or incandescent lamps to 4,000 lumens. Two refractors are available for a choice of distribution patterns.
Revere Electric Mfg Co, 7420 Lehigh Ave, Chicago 48, Ill.



Data Processor . . .

. . . with modular construction can be expanded from a basic system of limited capacity to a large system. The main memory, magnetic-tape file input and output systems of the National 315 electronic data processing system are variable in size. The processor memory stores up to 120,000 decimal digits. Magnetic tape files each store 31 million decimal digits.
National Cash Register Co, Product Information Section, Dayton 9, Ohio.

Stringing Block . . .

. . . especially for reconductoring when the old conductor is used as the pulling line has a wide throat, which easily passes splices, compression sleeves and swivels without fouling. The 73-A series blocks, available in 7-16-in. sizes, with or without neoprene sheave linings, have aluminum alloy frames.
Sherman and Reilly, Inc, First and Broad St, Chattanooga 2, Tenn.

Scanning System . . .

. . . monitors multiple signals from a group of transducers that report such conditions as temperature and pressure. The Selectomatic transducer scanning system, which is all-electronic with solid-state switching, picks the desired signal from multiple inputs and displays it on the indicator. The operator can also read single values.
Simmonds Precision Products, Inc, 105 White Plains Rd, Tarrytown, N. Y.

KNOW-HOW

Victor 900 Suspension Insulators (EEI-NEMA, TDJ52-3) are universally used by utility men because they're rugged and built to last.

Looking at a VICTOR Suspension insulator, you'd think it was an easy item to manufacture. It isn't. You don't just stamp them out like cookies, bake them in an oven and presto—insulators. No, a lot of research, engineering and manufacturing know-how over a long period of years is required to produce insulators that have uniform performance characteristics and far exceed EEI-NEMA standards.

VICTOR has an enviable reputation for knowing how to make insulators that are superior in performance under the most gruelling conditions of service. Many a power man has decided to play safe . . . and choose VICTOR. For catalog, specifications and prices, contact your nearby Victor sales office. Victor Insulators Division, I-T-E Circuit Breaker Company, Victor, N. Y.

I-T-E CIRCUIT BREAKER COMPANY

POWER TRANSFORMER SOUND REDUCTION THROUGH PROPER APPLICATION OF A SPECIAL NEW CORE STEEL

Improved power transformer cores having a marked reduction in the sound energy generated are now available as a result of a basic development program directed at the source of sound as contrasted to the suppression of sound

by

C. M. LOVELL,

Vice-President in Charge of Engineering and Research

Introduction

Many important steps have been taken by the transformer manufacturers in recent years to reduce power transformer sound; but in some areas, the electric utilities' transformer sound problem has continued to grow. A big factor in the growth of this problem is the increased public sensitivity to transformer sound. While this may be absurdly acute in some cases, the fact of a growing and serious public reaction makes the problem of sound of major concern to the electric utilities.

Moloney Electric Company is conducting several developmental programs to obtain practical and economical methods of alleviating the utilities' transformer sound problem. The particular program discussed here is a basic development program aimed at reducing sound levels by attacking the problem at its source through the proper application of a new core steel.

SOURCE OF SOUND

Sound energy is generated in the power transformer core by magnetostriction—a pulsating change in length of the core steel when carrying alternating flux. While some additional sound energy is generated by pulsating attraction forces within the core, this sound can be readily minimized by skillful core design and manufacture.

The sound energy thus generated by magnetostriction in the core is transmitted mechanically to the tank and outer accessories of the transformer—from there to the surrounding area.

APPROACH TO SOUND REDUCTION

There are obviously two main channels of attack on sound—

MOLONEY ELECTRIC COMPANY

Since 1896 . . . MORE POWER TO YOU . . . WITH

(a) Reduction of the amount of sound energy emanated from the transformer by using suppressive means.

(b) Reduction of the amount of sound energy generated at the source—that is, in the core.

A great deal of work has been done by the transformer manufacturers in the development of various means of suppressing sound. In those cases, however, where substantial and consistent reductions are achieved—such as with double tanks—the degree of cost increase is high. Also, the weight, dimensions, and complexity of the transformer are substantially increased. With lesser suppressive means—such as resilient supporting pads—the sound reductions achieved tend to be marginal and inconsistent.

These results indicate that reduction of the sound energy generated at the source is a more positive approach to the problem than the use of suppressive means.

NEW SPECIAL TYPE OF STEEL

In response to a request by the Moloney Electric Company, the Allegheny Ludlum Steel Corporation has developed and made available a special low magnetostriction steel known as "SILECTCOR".

This special steel is stress free, exceptionally flat, and has a remarkably low magnetostriction characteristic. Basic watt loss or permeability remain the same as for conventional cold-rolled oriented steel.

APPLICATION OF THE SPECIAL NEW STEEL

To properly apply SILECTCOR to power transformers on a production line basis it was necessary that new core design and manufacturing techniques be developed. Without these new techniques, the superior qualities of the special steel would not be reflected in improved core performance.

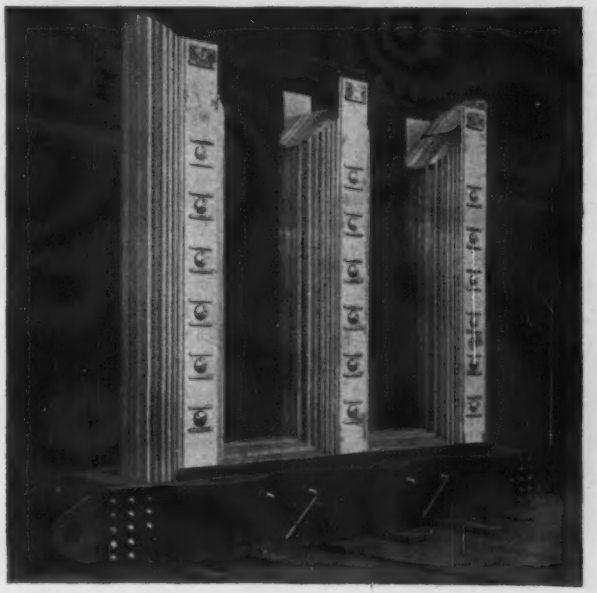
The new core design and manufacturing techniques necessary were developed by Moloney Electric Company after an extended research program to determine the design and production procedures that would result in the lowest sound levels at a reasonable cost.

To date, these new techniques and the special steel have been successfully applied by Moloney Electric Company to approximately 150 power transformers ranging in capacity from 500 KVA to 217,000 KVA. It is planned to steadily increase the application of this new steel to Moloney power transformer production.

RESULTS ACHIEVED

Other factors the same, average reductions of approximately 8 decibels in sound level are consistently attainable as a direct result of the proper application of SILECTCOR to the larger sizes of power transformers. The reductions decrease gradually to approximately 4 decibels for the smaller sizes.

It is significant that these sound level reductions are attainable for a reasonable manufacturing cost increase and without increasing weight, dimensions, or complexity of the transformer.



Cores built with SILECTCOR are remarkably straight as illustrated. This straightness minimizes clamping stress concentration and thus leads to side benefits of reduced core loss and exciting current.

The program is a good example of the positive value to the electric utilities of the constructive research and development being carried on in the manufacturing industry. Moloney Electric Company is conducting continuous research and development programs both in cooperation with customers and suppliers, and independently, to find better answers to the transformation problems facing the industry.

ME-60-22

FACTORIES: ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

TRANSFORMERS FOR UTILITIES • INDUSTRY • ELECTRONIC APPLICATIONS

Crapo GALVANIZED STEEL STRAND

WEIGHT OF COATING TEST

...added assurance of dependability

The life of galvanized steel strand depends primarily upon the weight and quality of the zinc coating. The heavier the coating the longer the strand will last.

The wire used in CRAPO Galvanized Steel Strand is regularly subjected to the hydrochloric acid antimony chloride, or weight of coating, test. By means of this test the amount of zinc on the surface of the wire can be accurately measured.

This is but one of the many laboratory tests to assure consistently high, dependable quality in the finished product.

AVAILABLE IN 3 COATING WEIGHTS

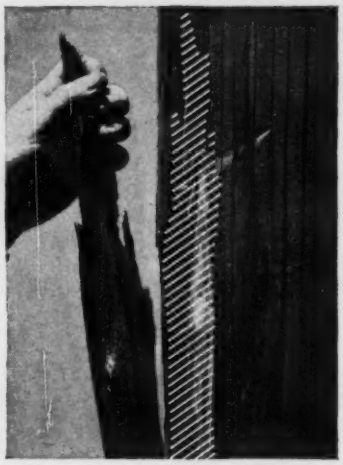
CRAPO Steel Strand is regularly furnished in all standard sizes and grades and in Class A, B and C coatings. Class B coating is twice as heavy as Class A coating; Class C coating is three times as heavy.

Write for this FREE BOOKLET!

"The Story Behind CRAPO Galvanized Wire and Strand" describes and illustrates manufacturing and testing techniques. Ask for Booklet B-59!

INDIANA STEEL & WIRE CO., INC.
Muncie, Indiana

SHELL ROT is often more subtle than this...



but POLE SPRAYERS can STOP IT in time!

"Shell rot" in the above-ground areas of older poles is a common form of decay—and can be dangerous. By the time it is visible to the eye it is a hazard to climbing personnel. The time to stop it is *before* it reaches that perilous stage. The surest, best *way* to stop it is by using POLE SPRAYERS men and methods!

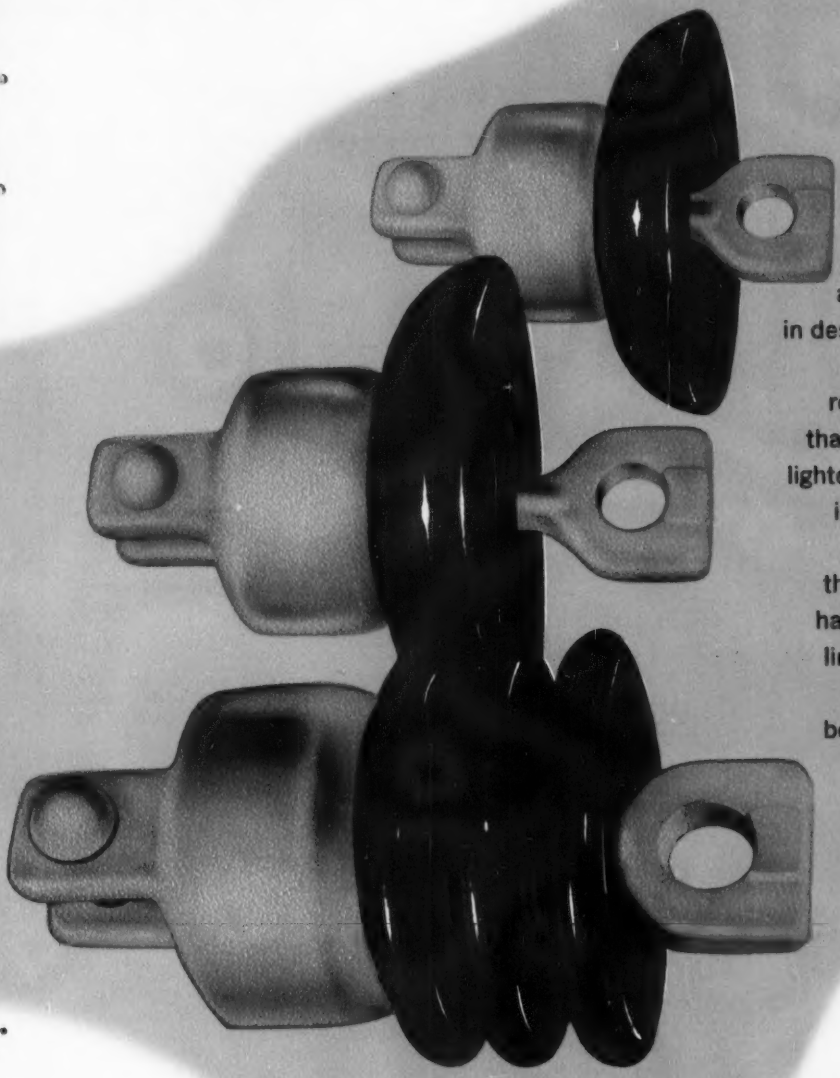
POLE SPRAYERS *men* know their business thoroughly . . . crews are trained and experienced in the art of evaluating decay above ground—and then providing protection against its further progress. POLE SPRAYERS *method* is completely effective...it *flows* the preservative onto the wood, using specially-designed, low-pressure equipment—thus giving slow, thorough penetration of all *critical areas*, as well as keeping surrounding property free from possible damage. Fungus decay is stopped cold...reinfestation is prevented!

Find out—for greater personnel safety and for greater company profit—how efficient and economical a POLE SPRAYERS program can be. Write Pole Sprayers, Inc., 991 Ellicott Street, Buffalo 9, N. Y.

Pole Sprayers Inc.

SERVING UTILITIES SINCE 1935

NOW... Aluminum Caps and Studs on CHANCE distribution deadend insulators



Mean fewer pounds to handle... longer life

Here's the new look in distribution deadend insulators... Chance Insulators with aluminum caps and studs. New in design. News because they're the first insulators with corrosion-resistant all-aluminum hardware that makes them as much as 30% lighter than standard insulators and ideal for all types of distribution deadend installations. Because they are lighter, they're easier to handle and install... simplify the lineman's job when he's hanging two or more insulators. And, because the aluminum hardware is highly resistant to all weather and industrial corrosion factors, they have a longer service life. Your Chance Man has the full story. Get it. Then, use these new Chance Insulators for better distribution line construction.

the first insulators with ALL-ALUMINUM hardware for savings on weight and resistance to corrosion

ABC INDUSTRIES

A. B. CHANCE CO.

CENTRALIA, MISSOURI

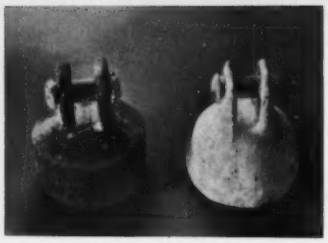
A. B. Chance Co. of Canada, Ltd., Toronto

TO HELP YOU

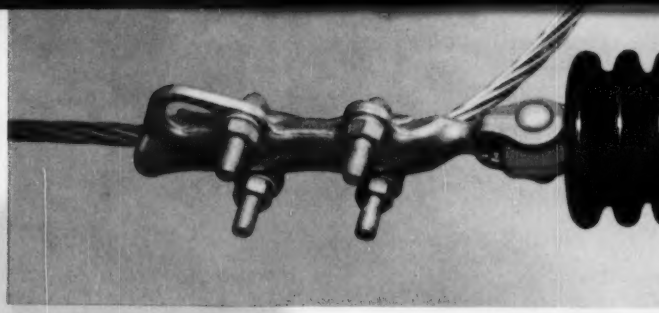
BREAK THE POUND BARRIER

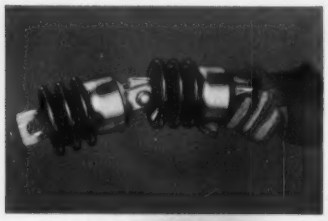
HERE'S WHAT THE CHANCE MAN HAS IN HIS LUNCH BOX

*HAROLD ELLIOT
CHANCE PRODUCT MGR. INSULATORS



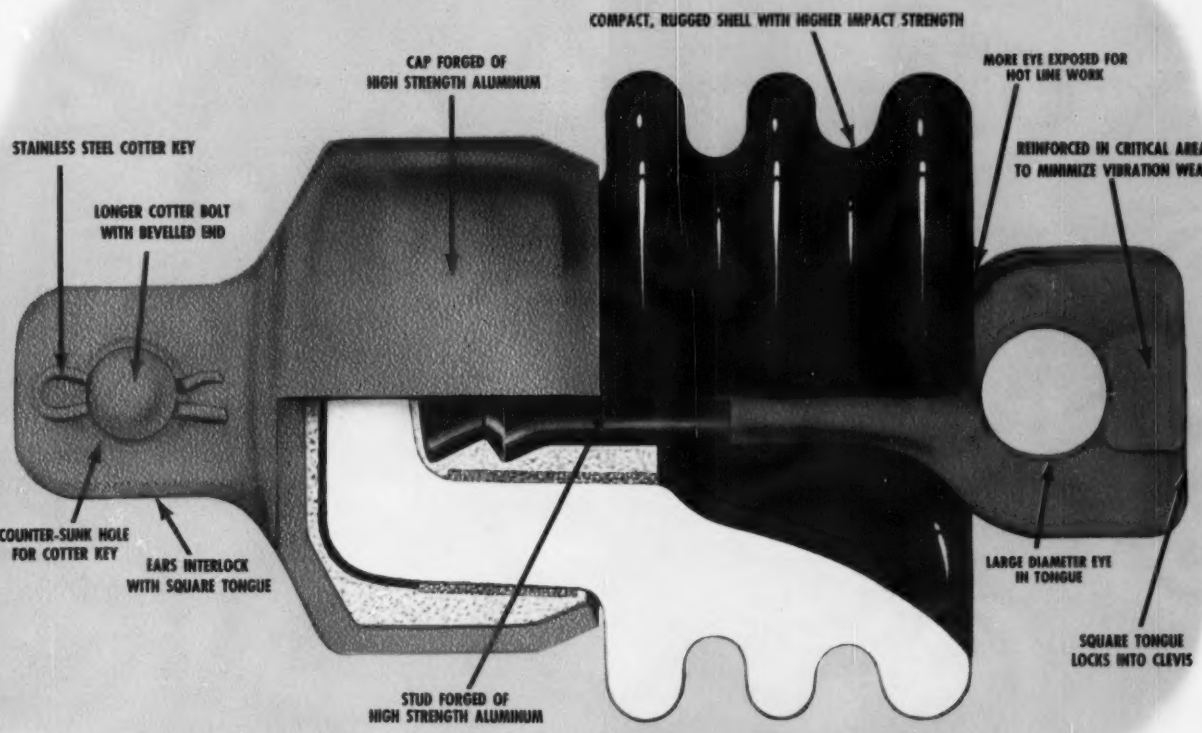
500 hour salt fog tests had little effect on aluminum cap, on the left, while ferrous cap, on the right, is badly corroded and damaged after the same amount of exposure.



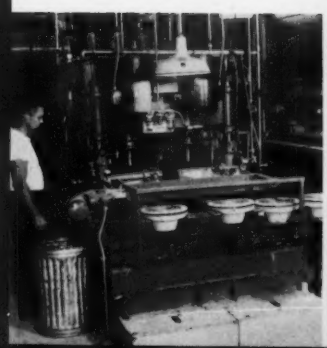


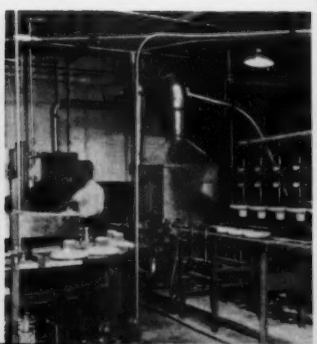
SLIM-LITE Insulator units can be handled easily without breaking because the square tongue in the clevis keeps units apart.

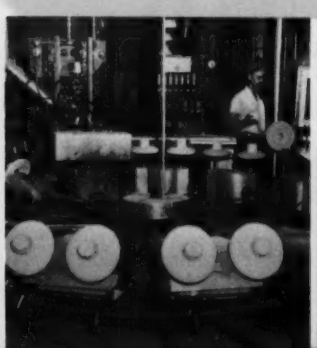
NEW CHANCE SLIM-LITE DISTRIBUTION DEADEND INSULATOR WITH ALL-ALUMINUM HARDWARE

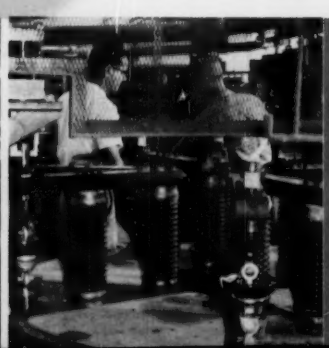

COMPACT, RUGGED SHELL WITH HIGHER IMPACT STRENGTH
CAP FORGED OF HIGH STRENGTH ALUMINUM
MORE EYE EXPOSED FOR HOT LINE WORK
STAINLESS STEEL COTTER KEY
REINFORCED IN CRITICAL AREA TO MINIMIZE VIBRATION WEAR
LONGER COTTER BOLT WITH BEVELLED END
COUNTER-SUNK HOLE FOR COTTER KEY
EARS INTERLOCK WITH SQUARE TONGUE
LARGE DIAMETER EYE IN TONGUE
SQUARE TONGUE LOCKS INTO CLEVIS
STUD FORGED OF HIGH STRENGTH ALUMINUM

SHELL DESIGN HAS 35% GREATER PUNCTURE VALUE









Less Weight...Longer Life

You get these operating advantages:

- **30% reduction in weight for handling ease**
  Use of a forged aluminum cap and stud breaks the insulation "pound" barrier . . . makes this new insulator more than 1½ pounds lighter than a standard 6-inch disc. Simplifies the lineman's job when he's hanging two or more insulators.

- **Longer service life in highly corrosive areas**
  The aluminum hardware is highly resistant to all weather and industrial corrosion factors. Salt fog tests prove this. The insulator's "fog-type" construction makes it possible to use this one type for all distribution deadend installations.

- **Greater impact strength, higher puncture values**
  The rugged design of the insulator shell, along with the compression glaze and improved manufacturing techniques, gives this insulator a higher mechanical impact rating, and a puncture voltage rating of 35% higher than a standard 6-inch disc.

- **Slim contour gives better appearance to lines**
  This handsome, slim, compact insulator improves the appearance of distribution construction, an important factor in residential areas.

- **Easier to work with hot line tools**
  The insulator's shape gives linemen more clearance for working with hot line tools. And, such features as a longer cotter bolt with beveled ends, a countersunk hole for the cotter key, a large diameter eye in the tongue, and more eye exposed, make the lineman's task easier.

- **More adaptable to cover-up equipment**
  The insulator's compact design simplifies covering with most any type of cover-up equipment.

- **Prevents breakage of insulator during construction**
  The square tongue keeps units from falling together and breaking porcelain. This feature, plus the light weight, makes them easy to handle and reduces breakage in storage or in transit.

- **Completely tested for electrical and mechanical characteristics**
  The merits of this new design have been test-proved. Tests include fault current testing under tension, steep wave front and standard impulse tests, time load tests, and all other electrical and mechanical tests necessary to prove the performance of the SLIM-LITE Insulator.

ABC INDUSTRIES

A. B. CHANCE CO.

CENTRALIA, MISSOURI

A. B. Chance Co. of Canada, Ltd., Toronto

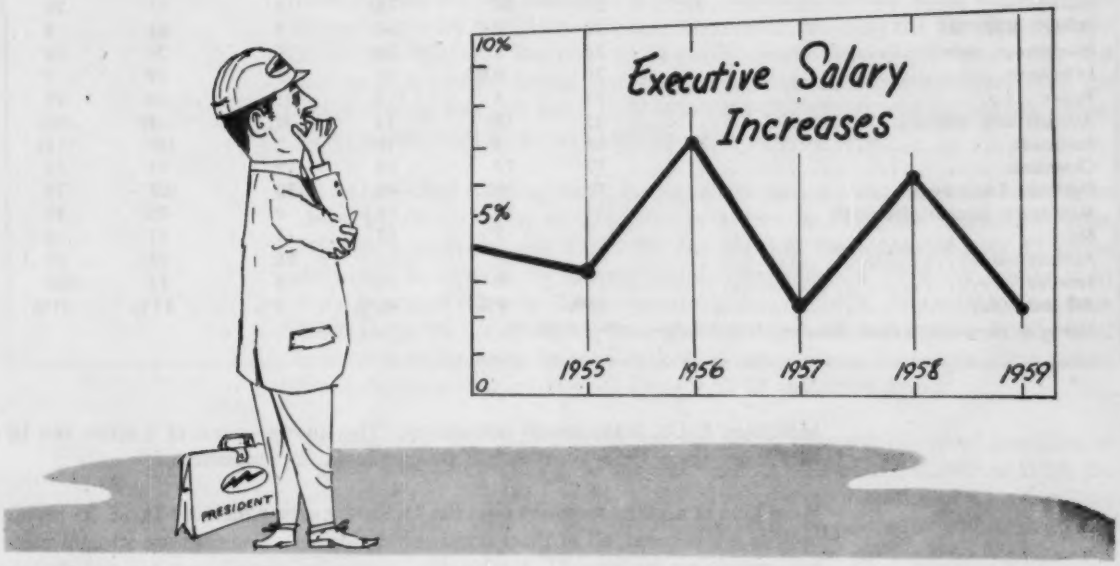
C160-19

Watch for more to come from the new Chance insulator production line

Electrical World

OCTOBER 31, 1960

Management Newsletter



Executive Compensation: Smaller Gain in '59

Slowly but surely, utility executives are catching up to their better-paid counterparts in other industries. Not as fast as they have in the immediate past—and probably not as rapidly as they would like to—but fast enough to keep narrowing the "compensation gap" between themselves and men running the same sized companies in other industries.

How much of a gain are they making? In one recent survey of executive compensation, the average increase for top executives in 35 utilities in 1959 was about 2%, making utilities 19th on the list of 25 industries studied. By comparison, top executives of the automotive industry, biggest gainer on the list, racked up an average increase of roughly 27%. Even in the reputedly struggling railroad industry, executives showed a 4% increase from 1958 to 1959. And the all-industry average was about 8%.

But short-term gains don't show the whole picture. As the tabulation at the top of page 82 indicates, on a broader base the utility picture is considerably brighter. For example, in the six-year period from 1953 to 1959, average compensation for top men in utilities climbed 28%, making them fifth fastest grower on the list. And on the longer term, the increase in payoff for automotive men boiled down to only 2%, making them 23rd of the 25 industries, while railroad executives, in 12th place, showed an 18% boost. All-industry average in this period was 16%.

The figures above are from an annual survey of executive compensation made by

% Change in Chief Executive Compensation, Sales, and Profits

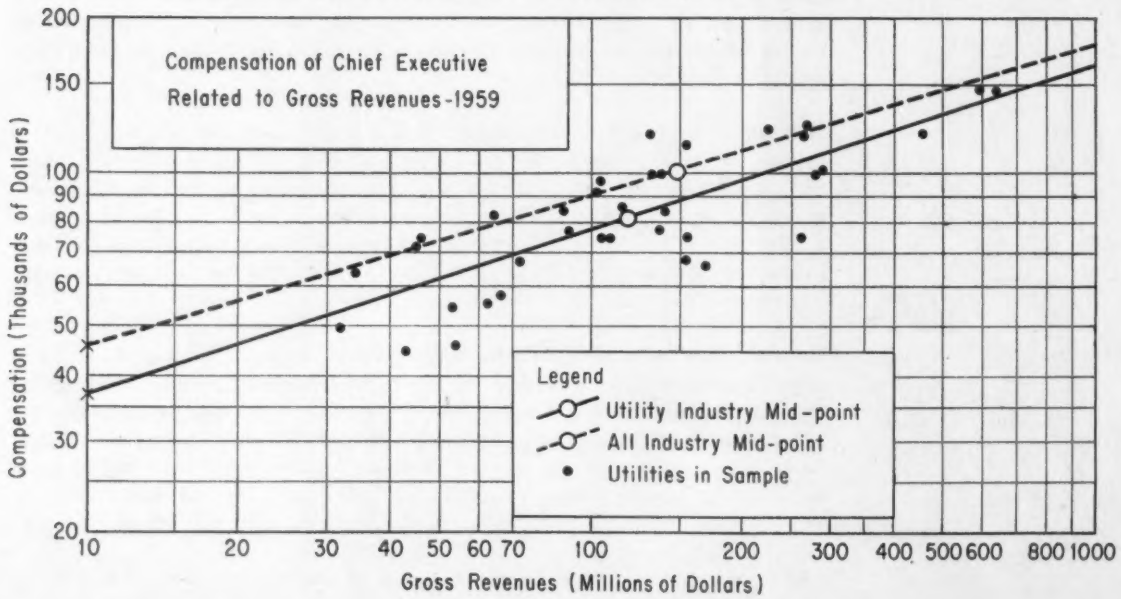
Industry	Compensation		Sales		Profits	
	1953-1959	1958-1959	1953-1959	1958-1959	1953-1959	1958-1959
Large Diversified Companies	46	7	103	18	43	26
Business Machines	41	12	132	12	172	9
Air Transport	30	9	98	18	21	53
Electronics	29	24	74	19	11	30
PUBLIC UTILITIES	**28**	**2**	**60**	**9**	**65**	**8**
Nonferrous Metals	26	5	26	10	21	22
Petroleum	26	0.03	47	7	19	9
Paper	23	6	112	15	34	21
Aircraft and Missiles	23	(2)	34	(2)	(18)	(33)
Railroads	18	4	(7)	2	(37)	(15)
Chemicals	13	12	54	12	71	14
Electrical Equipment	11	(1)	48	20	107	38
Machinery (except electrical)	11	10	15	9	23	33
Steel	7	7	12	11	11	4
Automotive	2	27	33	25	37	95
Textiles	(10)	8	38	19	24	103
All Industries	**16%**	**8%**	**43%**	**9%**	**31%**	**21%**

Figures in parenthesis indicate decrease. Nine industries omitted from list.

McKinsey & Co, management consultants. The survey—latest of a series run by McKinsey since 1953—covers 605 companies in 25 industries.

What kind of a utility sampling does the McKinsey survey include? In all, 35 power utilities are covered, all of them operating companies. Fourteen are straight electric companies; the other 21, combination companies, serving both gas and electric customers. In gross revenues, the utilities included range from about $30 million to well over $500 million. Eight showed gross revenues of more than $200 million in 1959, and another 14 were in the $100 to $200 million bracket. The last 13 were below $100 million. Average revenue for the whole group was $118 million.

Sample of 35 utilities shows 1959 compensation closer to all-industry line



In the McKinsey survey, the chief executive is considered to be the man with the highest compensation in the company, presumably on the theory that most companies pay a man in proportion to his responsibility and authority. In most cases, this turns out to be the president. But in other companies, it may be the chairman of the board, the head of the executive committee, or some similar title. For purposes of the study, compensation was defined as salary, pension payouts, and deferred accruals awarded during the year. Stock option awards, compensations to pension plans, and other fringe benefits were not included.

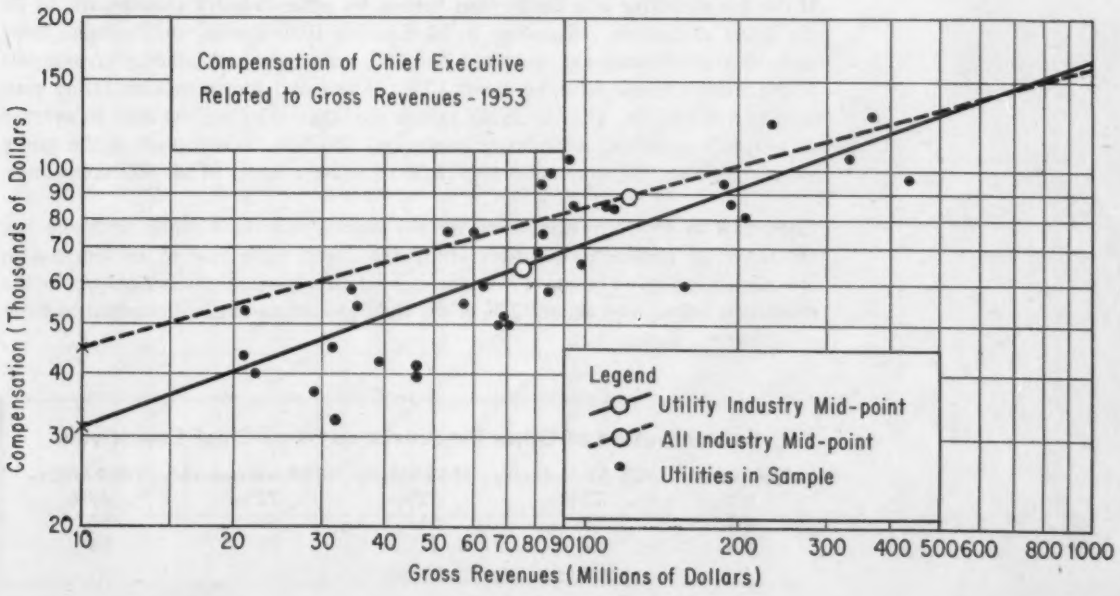
How well did the top executives in these companies actually make out? Average compensation for the 35 companies in the sample, including the 2% increase from 1958, was $82,000. But only 13 of the 35 companies—slightly more than last half those in 1958—showed increases for their chief executive officers. And the utility average was still some 13% below the all-industry average for top executives of companies at the $118-million gross revenue level.

On an individual company basis, the pay-off to the top utility executive varied from about $45,000 to close to $160,000 in 1959. In 1953, the spread was from $32,000 to approximately $130,000. The graph at the bottom of page 82 shows the actual distribution by revenue and compensation for 1959. A similar chart at the bottom of this page shows comparable data for 1953. The solid line on these charts shows the utility industry's compensation/revenue line, mathematically fitted to the dots representing the individual utility companies in the sample. The dashed line is the compensation/revenue line for all 25 industries studied.

Working from the "best fit" line for the utility industry, the chief executive of a utility with $50 million gross revenue would have earned $62,000 in 1959; the head of a $100 million company, $78,000; and the top executive of a $200 million utility, $92,000. In each case, the average would be below the all-industry compensation/revenue line. But the line of "best fit" for the utilities is noticeably closer to the all-industry line than in 1953.

In 1959, only two utilities, both relatively small, paid their top man less than $50,000. Twelve companies paid him $100,000 or more. By comparison, in 1953, eight utilities paid the chief executive less than $50,000 and only four, more than

than in 1953, with strongest gains in smaller companies



$100,000. Matching the individual utility dots against the all-industry line in each chart, it is apparent that rewards for execs in the smaller utilities moved up a little faster than for those in the larger companies.

How does this year's rise in top utility salaries compare with the past? Over the past five years, the McKinsey survey shows a zig-zag pattern. Thus the top man's compensation rose 3.3% in 1955, 6.9% in 1956, 2.2% in 1957, 5.9% in 1958, and 2.0% in 1959. This pattern explains, to some extent, the relatively low utility increase in 1959 compared to the all-industry average. For while utility compensation increased 5.9% in 1958, the average for all industry decreased slightly. Thus the sharp 8% all-industry increase in 1959 is, in part, only recouping ground lost in 1958.

Taking a closer look at individual utilities, what factors affect the size of the top officers compensation? Company size is one of the principal ones. As might be expected, the top man's cut is a smaller proportion of the gross revenues in a large company than in a small one. For example, in the eight largest companies sampled, all grossing over $200 million, the average ratio of chief executive compensation to gross revenues was about 0.044%. And, if one company paying an unusually high ratio was excluded, the average for the other seven was only 0.035%.

Moving down the line, the average ratio for the next 14 companies was about 0.07%. Ratios for these companies, all in the $100 to $200 million gross revenue bracket, varied from 0.045% to 0.092%, generally increasing as the size of the company decreased. In the last group, the 13 smallest companies, average ratio was about 0.118%, with extremes of 0.085% and 0.188%.

One major influence on compensation gains was turnover in top men, and here the utility sample ran relatively high. Of the 35 companies included in the sample, 19 or about 54% put a new man in the top-paying job between 1953 and 1959. Average for the all-industry sample for the same period was only 47%. On the whole, the new utility executives were paid less than their immediate predecessors. In fact, the only two utilities reporting decreases in top executive salaries in 1959 were both companies who put a new man on the job. Similarly, in the all-industry sample, chief executives who stayed on the job over the six year period from 1953 to 1959 reported a 24% increase in compensation, 50% more than the increase for all industry sample in the same period.

If the top executive in a utility runs behind his other-industry counterpart, so do the lower executives. According to McKinsey's 1959 figures, the "number two" man in a utility company averaged $56,500, trailing his all-industry counterpart at the same revenue level by about 17%. Third and fourth-ranking utility men were in a similar fix. Utilities in the sample paid their third-highest man an average of $47,500 against an all-industry average of $56,500. Fourth man in the utility sample got $45,000, compared to $52,000 for the average of all 605 companies.

Compared to 1953, compensation for the second man in a utility company has fallen slightly relative to the other utility executives, while that of the fourth man has risen slightly. Thus in 1953, the second man's compensation shown in the tabulation below, was about 72% of the chief executives but had dropped to 69% in last year's survey.

Compensation of Other Executives as % of Chief Executive's

Executive	1953-All Industry	1953-Utility	1959-All Industry	1959-Utility
#2	72%	72%	72%	69%
#3	58	55	60	58
#4	54	52	55	55

Provide Proper Sports Area Lighting

Adapted from Bulletin OLP-1015 issued by the General Electric Co

Read mounting height along diagonal at intersection of appropriate horizontal and vertical lines.

Example:

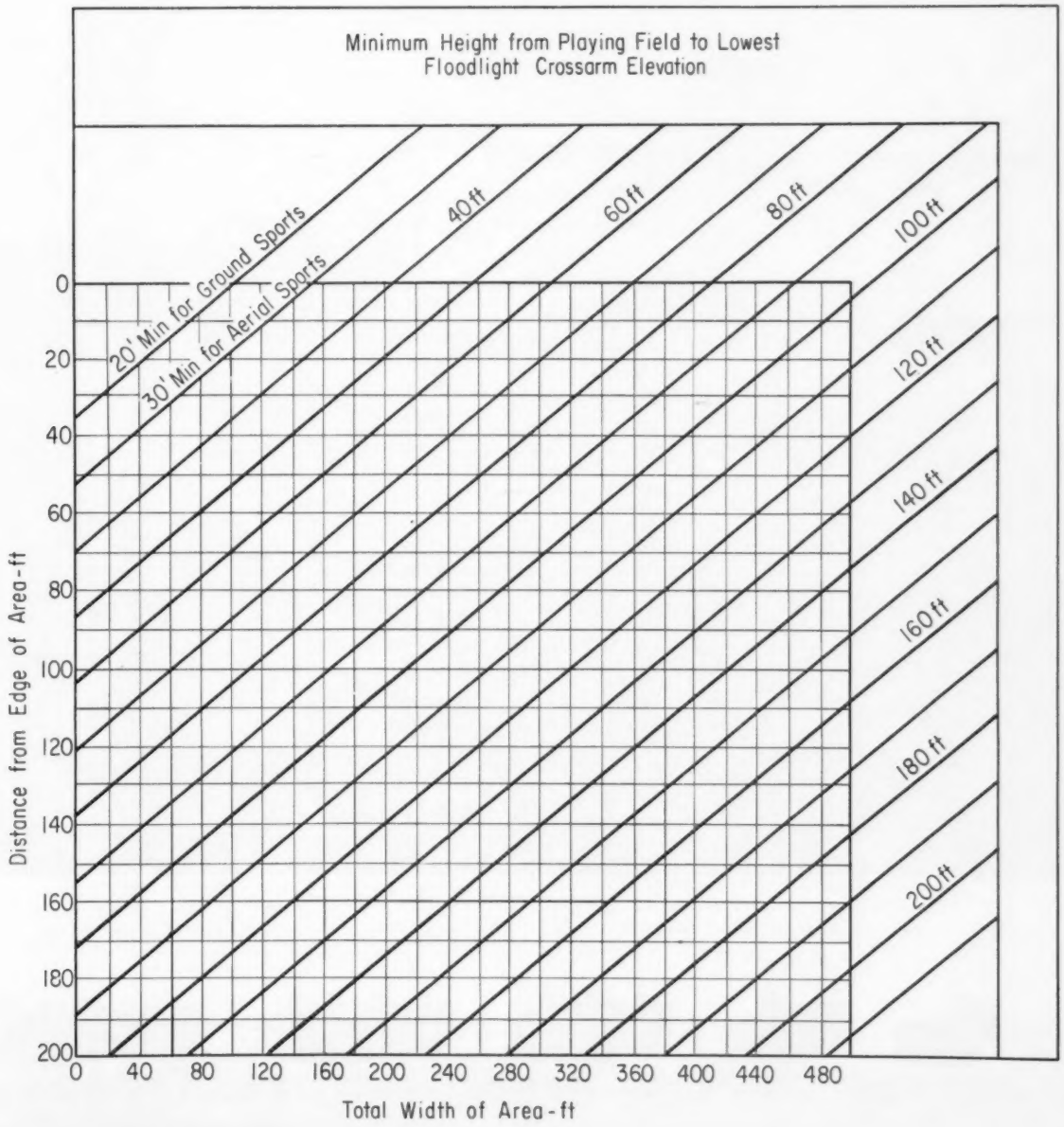
Area width 160 ft, pole setback 70 ft. Minimum height indicated by diagonal at intersection of 70 ft and 160 ft is 72 ft.

Notes:

1. Do not use this chart for baseball. Minimum mounting heights for baseball shall be determined from standard layouts.

2. Data are in accordance with I.E.S. Recommended Practice.

Mounting Height Chart for Sports Areas



MU-20 2000 KW Diesel
MU-14DF 1000 KW Dual-fuel

MU-40 4000 KW Diesel
MU-28DF 2000 KW Dual-fuel

MU-60 6000 KW Diesel
MU-42DF 3000 KW Dual-fuel

MU-80 8000 KW Diesel
MU-56DF 4000 KW Dual-fuel

MU-100 10,000 KW Diesel
MU-70DF 5000 KW Dual-fuel

From Public Service Co. of Oklahoma . . .

Improved Power Service To Grandfield, Oklahoma

In the Southwestern corner of Oklahoma, Grandfield lies at the end of a long 33,000 volt transmission line that starts at Lawton, Okla. 32 miles away. To bring improved customer service to this growing community, Public Service Company of Oklahoma installed a 2000 KW Electro-Motive Diesel plant in June, 1960, to provide area protection and peaking service.

New Plant Proves Its Value

The value of the Electro-Motive plant for area protection was proved only one week after its installation when one of Southwestern Oklahoma's sudden, severe storms caused a loss of power on the line from Lawton. Within 60 seconds, the Electro-Motive plant automatically started, came up to full speed and was supplying Grandfield with adequate power. Again, on August 9, during a period of peaking operation, the 33,000 volt transmission line suffered an outage due to an electrical storm. Automatically the Electro-Motive plant switched from peaking service to isolated operation to supply the area with emergency power.

Maximum Area Protection

The Grandfield area served by Public Service Company now gets maximum area protection in case of line outage because of the special dead load pick-up feature built into the Electro-Motive plant. It can pick-up a dead load with starting in-rush at five times its rated KVA and come back up to full voltage and a steady state condition in 30 seconds. And, the plant will continue to supply power for this load as long as required.

Remote Control Operation

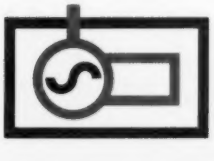
The Electro-Motive plant at Grandfield operates as a peaking unit by remote control. During periods of heavy power use, the unit can be brought on the line from a remote location. On this signal, the unattended plant automatically starts, synchronizes and goes on line in less than two minutes.

Adaptable To Many Functions

The inherent design characteristics of the Electro-Motive equipment at Grandfield that make it ideal for peaking and area protection also make it possible for Public Service Company to add additional generating units in the future to bring the plant up from 2000 KW to 8000 KW. And, they can do this at low incremental cost when load growth occurs. These characteristics of Electro-Motive plants make them best suited for many of your system requirements, too:

- fast start for spinning reserve
- automatic dead load pick-up for area protection
- unattended operation for remote peaking service
- portability for simple installation
- freedom from damage to components caused by rapid thermal changes occurring from start to full load

Available in units from 2000 KW to 10,000 KW, the Electro-Motive peaking equipment line contains both Diesel and dual-fuel plants that can permit matching the plant to exact requirements for the most economical and efficient operation at the lowest investment. Ask your Electro-Motive representative for complete details.



ELECTRO-MOTIVE DIVISION
GENERAL MOTORS La Grange, Illinois

Sales-engineering offices: Chicago, New York, St. Louis, San Francisco

In Canada: General Motors Diesel Limited, London, Ontario

Nixon Pledges 2% Co-op Interest Rate

Vice President Richard M. Nixon, in a sharp break with the Eisenhower Administration, has pledged to maintain the 2% interest rate on Federal loans for rural electric and telephone cooperatives.

Nixon's position is spelled out in precise terms in a letter sent recently to all Rural Electrification Administration cooperatives directors of the nation, all REA newspapers, and Republican Gubernatorial, Senatorial and Congressional candidates in all 50 states.

The letter was in response to a couple of developments. First were the requests from Republican candidates in the Midwest and other rural areas where continuation of low- interest loan rates are presumed to be a politically popular thing. Second was a Democratic broadside, released by the National Farmers for Kennedy organization, asserting that Nixon is anti-REA.

Both the presidential candidates, Nixon and Sen John F. Kennedy, now have swung to the same general viewpoint on the future of REA. The issuance of Nixon's letter removes the last possibility of any considerable difference between them on principles in this area.

Nixon's letter takes no note of Pres Eisenhower's repeated requests—the last one being in his 1961 budget submitted last January—for a rise in the REA loan rate. What Eisenhower proposed was that REA's Treasury loans should bear interest rates equal to the average of the going rate paid by Treasury on long-term, marketable bonds—plus one-fifth of one percent to cover administrative expenses and estimated losses.

Nixon's letter says, "These are my objectives for the REA programs:

1. "Assure that enough funds are made available to meet all loan needs of REA borrowers.

2. "Maintain the present interest rates for activities clearly related to the needs of rural areas.

3. "Help provide abundant electric power for REA borrowers, including the use of REA generation and transmission loans where needed and feasible."

The Nixon letter says, "While our record of progress in recent years has been outstanding, we must realize that the years of greatest growth for systems financed by the REA lie ahead of us. Farmers are using more electric power for production. More people and more business and industry are moving to our rural areas."

First Antitrust Trial Begins Today in Philadelphia (*Continued from page* 47)

blies," (2) allocating business to federal, state, and local governmental agencies; (3) submitting "noncompetitive, collusive and rigged bids. . . . to electric utility companies, federal, state, and local governmental agencies, private industrial corporations and contractors," and (4) refraining "from selling certain types of power switchgear assemblies or components thereof to other manufacturers of electrical equipment."

Another point of interest to observers is the role defendant Arthur F. Vinson, GE group executive, will play in the trial. Vinson was not named in the first indictment handed down in February. That indictment was essentially withdrawn in June and replaced by an amended version which contained Vinson's name but not the names of two other GE individuals mentioned as defendants in the first version.

And late in August, Vinson's lawyer, Boris Kostelanetz, unsuccessfully argued for a separate trial for Vinson. Kostelanetz told the judge he believed the other GE individual defendants had "made statements or representations to the prosecution wherein they do not deny the substance of the government's factual claim but deny the legal conclusions therefrom. To support their claim of innocence they apparently assert that they committed the acts charged under orders of my client and others . . . not indicted."

Thus the defense appears to be shaping up into a three-way battle, with (1) GE and Westinghouse corporately arguing that they are not responsible for the acts of their individuals as these were contrary to the companies' policies; (2) the 5 GE individuals arguing that they did the acts under orders from their superiors; and (3) Vinson denying the allegations.

Double Jeopardy Will Be Issue

GE and Westinghouse also will attempt to show that double jeopardy is involved in this and other indictments, since the same equipment (such as switchgear and transformers) plays a part in several indictments. This tactic was brought out in a pre-trial hearing in August, but so far the judge has not been convinced that there is a case for double jeopardy.

On the other hand, the prosecution's case will be to show that some 26 meetings were held by the defendants between November 1958 and September 1959 for the purpose, among others, of (1) setting or increasing price levels; (2) rigging bids to private customers by using a "phase of the moon" or "light of the moon" formula; and (3) allocating business to governmental agencies according to the percentages: GE 39%, Westinghouse 35%, I-T-E 11%, A-C 8%, and FPE 7%. Essentially, the prosecution hopes to do this by eliciting the same testimony from witnesses at the trial as had been elicited by the grand jury during the investigation.

At the trial, the GE defense counsel is Gerhard A. Gesell of the Washington firm, Covington & Burling; Westinghouse's counsel is Bruce Bromley of the New York firm, Cravath, Swaine & Moore. The GE defendants (other than Vinson) are being represented at the trial by a Philadelphia lawyer, Edwin P. Rome. Heading up the prosecution is Charles L. Whittinghill, chief of the General Litigation Section, of the Justice Dept's Antitrust Division. Chief Judge J. Cullen Ganey is presiding over the jury trial.

Gas Battles for 'Fuel of Future' Title

The fuel that tells the best heating-air conditioning story will be the fuel that in the future will be highest regarded for all major appliances. This is the thought of Wendell C. Davis, president of the Gas Appliance Manufacturers Assn and president of Cribben & Sexton Co. He talked at the American Gas Assn Convention in Atlantic City.

Davis believes that the 1960's may see one of the three major fuels —electricity, gas or oil—emerge a definite leader in household use. One will become the most important in the minds of consumers, and the other two will have to measure their progress through ". . . the dubious expedient of comparison with the then leading industry."

Although gas has the lead in several household chores now, Davis feels that exceptional promotion of gas air conditioning and refrigeration is due if it is to compete for the position as leading industry.

"We have the further job of developing the markets for newer appliances and newer household uses for gas," he said. "This would include an acceleration of sales of gas lights, outdoor barbecuing equipment, swimming pool heaters and others.

"The key to continued momentum lies with our ability to maintain and expand the use of gas as a heating fuel," Davis said. "Perhaps in the light of our industry's advances during the past decade we have tended to minimize the threat of oil as a full-fledged competitor for the heating markets of today and tomorrow.

"Electricity, as a fuel, played a secondary role to the growth of electric cooking," Davis said. "This same line of attack can be expected from electric heat—recognized and consumer-respected brand names will spearhead the attack on the heating markets of tomorrow."

Gas Second Largest Supplier

In the past ten years the gas industry has become fifth largest, in terms of plant investment, and the second largest supplier of energy, according to Wister H. Ligon, president of AGA and Nashville Gas Co.

Ligon said that in the same period a quarter of a million miles of new pipelines and mains have brought the total to 615,000 miles. About 900,000 new customers per year have been added in the last decade.

By 1970 AGA is forecasting a 34% increase in customers—to 43 million—and annual sales of $160 billion. Present sales are about $88 billion. A gross plant investment of $48 billion is anticipated, which is more than double the present $20 billion.

Near the close of his talk, Ligon mentioned earlier references to competition, and said:

"This nation leads the world in fuel production and energy use, largely because of the traditionally American freedom of enterprise we have so long enjoyed.

"But today, under the guise of establishing a so-called 'National Fuels Policy,' a one-energy industry would upset this system of free competition in favor of another system under which fuels and their end use would eventually be controlled by the government.

"Such control would impair the production, pricing, and ultimately the marketing of all fuels. While the damage to our industry would be irreparable, the real loser would be the consumer who would no longer be free to choose between competing fuels in an open market."

William R. Connole, former Federal Power Commissioner, told the group that greater stability of natural gas prices would result from the recent "Phillips Case" decision (EW, Oct. 3, p 14). He expects field prices to continue to escalate, but at a slower and more predictable rate.

Connole observed that prices established by the new ruling ". . . are just a shade above where the forces of competition would have placed them anyway."

Contrary to both Ligon and Davis, Connole believes that a "single energy" economy is farther away now than it has ever been.

This year's convention was keyed around the Festival of Flame, a 90,000-sq-ft exhibit (see photo). Displays included gas recent developments in residential, industrial and commercial gas appliances and equipment.

Kellogg's New Power Piping Plant

$4-Million Manufacturing Facilities Uniquely Equipped to Undertake Any Steam-Electric or Nuclear Assignment

Now in production at Williamsport, Pa., the Kellogg Power Piping Division's new plant is the most modern ever designed specifically to manufacture power piping for electric generating stations.

With these new facilities, Kellogg is equipped to undertake any steam-electric or nuclear assignment with greater efficiency, economy, and speed than ever before in its 40-year history of power piping leadership.

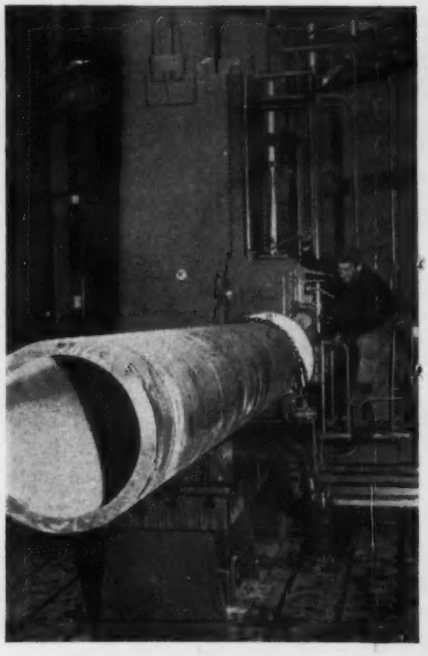
New equipment now in operation includes the latest machinery, worth in excess of $1 million, for machining, bending, and welding ferritic, austenitic, stainless, and other materials into piping of any wall thickness.

Carefully planned manufacturing sequences, on a production-line basis, assure a smooth and uninterrupted flow of operations from one end of the 900-ft. plant to the other.

Testing equipment for quality control includes the latest in electronic, radiographic, and ultrasonic advances. Two special vaults with 30-in. walls permit safe inspection with Iridium 192 and Cobalt 60.

Completely equipped metallurgical and welding laboratories, continually working to improve materials and techniques, aid in solving new manufacturing problems and are also available to clients as a service laboratory.

Kellogg's Power Piping Division welcomes inquiries on its new facilities, and extends a cordial invitation to engineers to inspect them personally.



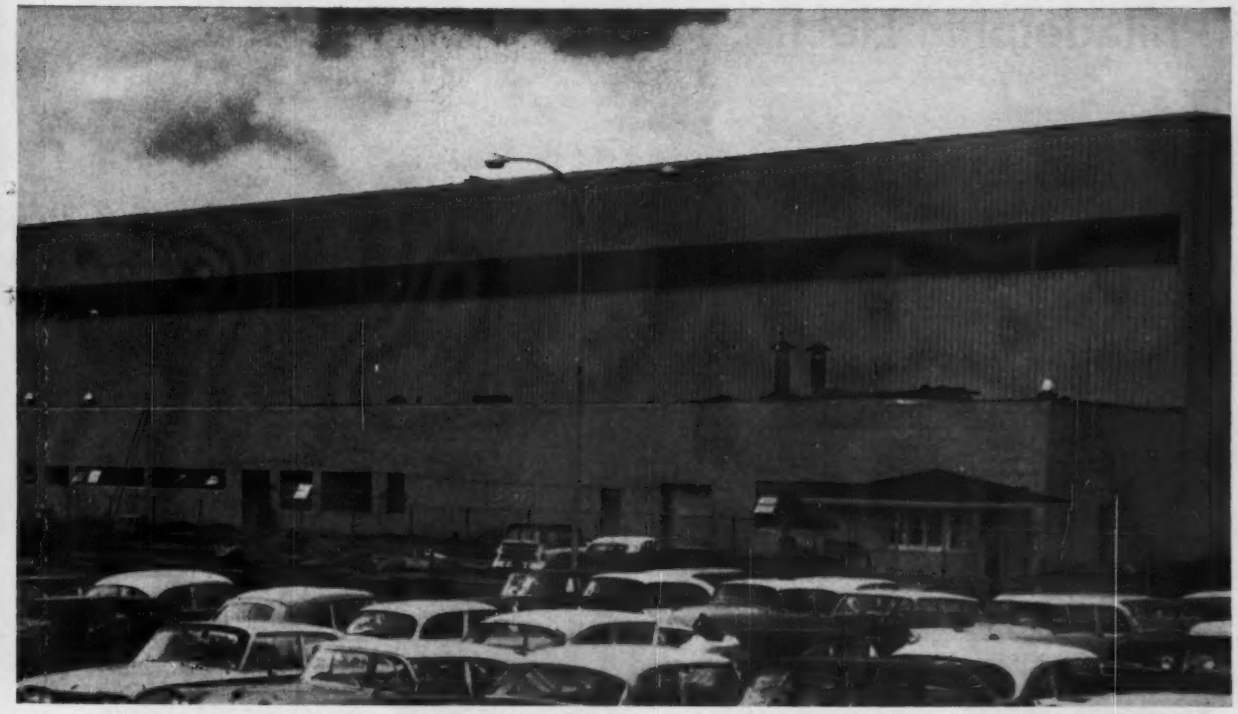
POWER PIPING DIVISION • THE M. W. KELLOGG COMPANY

Plant and Headquarters: Williamsport, Pa. Sales Offices: 711 Third Ave., New York, N.Y.

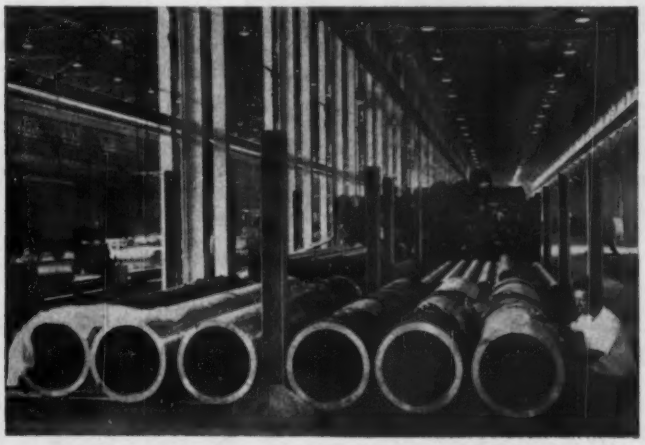
A SUBSIDIARY OF PULLMAN INCORPORATED

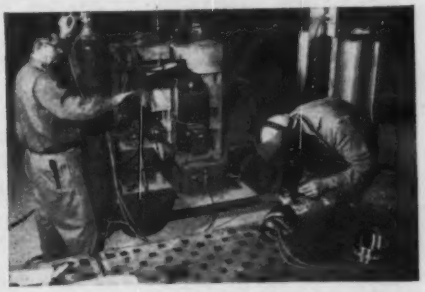
Offices of other Kellogg companies are in Toronto, London, Paris, Rio de Janeiro, Caracas, Buenos Aires

Now In Production at Williamsport



New manufacturing plant and headquarters of Kellogg's Power Piping Division—situated on a 50-acre site at Williamsport, Pa.





Above: Welding is a major phase of Kellogg's operations. Here, two thin-walled sections of stainless steel power piping are being joined by K-Weld—an inert gas-shielded technique of arc welding, patented by Kellogg, which assures long life.

Above: Raw materials bay, 40-ft. wide, extends the entire 900-ft. length of the plant. Piping and fittings are conveniently drawn from storage by overhead cranes and placed in the production line at any point in a planned manufacturing sequence.

Left: One of the new boring mills at Williamsport. Piping in machine is a stainless steel section—to be installed by Kellogg field erection specialists in the reactor sphere of a nuclear power station.

Left: Front entrance of Kellogg's new Headquarters Building. This ultramodern office building houses administrative, engineering, estimating, and accounting departments of the Power Piping Division. Sales offices remain at 711 Third Avenue, New York, N.Y.

Philadelphia Electric Appoints Gaty VP

Lewis R. Gaty has been elected vice president in charge of engineering and research at Philadelphia Electric Co.

Gaty joined Philadelphia Electric as a junior engineer shortly after graduation from Cornell University. He progressed through positions of responsibility, becoming vice president of research and development in 1956.

He has been active in the field of nuclear power development as a vice president of High Temperature Reactor Development Associates, Inc, and a vice president of Atomic Power Development Associates.

LEWIS R. GATY ▶

A. P. TABER

Taber Is Chosen VP At Babcock & Wilcox

Babcock & Wilcox Co has elected Alden P. Taber vice president in charge of the Research and Development Division. Since joining the company in June, 1959, Taber has been a member of the president's staff, coordinating and directing research and development.

A West Point graduate and holder of a master's degree in mechanical engineering from Massachusetts Institute of Technology, Taber was professor of metallurgical engineering at Syracuse University before joining B&W.

W. C. DRUMMOND

Pioneer S&E Names Drummond President

Pioneer Service & Engineering Co has chosen Warren C. Drummond to become president, succeeding the late Fred C. Kellogg.

Following graduation from Montana State College, Drummond was associated with Northern States Power Co from 1920 to 1925.

He has been with Pioneer Service & Engineering and its predecessor, Byllesby Engineering & Management Corp, since 1925. Starting as a mechanical engineer, he became chief engineer in 1945, and vice president in charge of engineering in 1953.

PERSONAL BRIEFS

E. A. Rochau, E. C. Byrd, and **W. F. Nelson** have been promoted to assistant test engineers in the test bureau of Consolidated Edison Co of New York. **Harry J. Bauer,** vice president in charge of production at Con Ed, was named a fellow by the American Society of Mechanical Engineers.

Howard B. Gould has succeeded **Rufus Moses,** who retired as Youngstown Division manager for Ohio Edison Co. **Charles B. Olds** replaced Gould as Alliance Division manager. Other changes: **C. A. Thrasher** became superintendent of electric and steam heating sales in Akron, and **Ronald D. Best** became general supervisor of industrial development.

Following the retirement of **Charles C. Yeakley** as head of Oklahoma Gas & Electric Co's Eastern Division, **Norborne C. Auld** has been named Yeakley's successor and **J. B. Lynn** has replaced Auld as Ada district manager.

H. S. Hinrichs has retired as assistant secretary and assistant treasurer and director of community service for Kansas Power & Light Co.

Minnesota Power & Light Co has made the following staff shifts: **Carl J. Thureen** succeeded **B. A. McTeigue** as treasurer; McTeigue continues as director, vice president, and secretary; **C. R. Bailey** and **Jennings F. Johnson** became assistant comptrollers; and **Robert M. Miller** was appointed assistant treasurer.

A. J. Borchers has retired as vice president and manager of the electric department of Central Illinois Public Service Co.

(*More News About People on p* 94)

formula has been changed.

You must know that the 1959 amendment to the TVA Act requires TVA to make cash payments to the Treasury totalling $1 billion, and that the remaining $200 million of appropriation investment in TVA power facilities is not "written off" but instead remains as the Government's appropriation equity. At the risk of boring you with facts, let me quote from the Senate Public Works Committee report on the 1959 amendment concerning the $200 million which you say "reduced" the TVA debt: "There would remain a relatively small amount of appropriation investment in the TVA power system, which would represent, together with the reinvestment of power revenues, the equity of the Federal Government in the System. The committee believed it advisable to retain some Federal equity in the assets of the Corporation." Your private power company readers should quickly recognize the importance of the principle of equity capital for a power system which is going into the private bond market.

Editor: The original TVA Act and amendments set forth repayment schedules indicating that the appropriation investment was considered a debt. Is it fair to taxpayers to now change the debt to equity (or risk) investment?

2. You say that TVA has paid only $250 million of the $1.45 billion government investment in TVA power facilities, and you wail that this is not "pay-as-you-go." Are you inferring that private power companies "pay-as-they-go" to meet the heavy capital requirements inherent in electric utility financing? The fact that private power company long-term debt rose from less than $8 billion to more than $18 billion in the 1948-58 period does not suggest "pay-as-you-go" financing. It is astounding that *Electrical World*, of all publications, would infer that growing power requirements anywhere in the country can be met, year after year, on a pay-as-you-go basis! Any informed reader of your magazine knows better, and, I hope, so do you.

Editor: Here you seem solidly on our side. Perhaps you would like to set Mr Kennedy on the right track by telling him that neither TVA nor any other utility operation can reasonably hope to be on a pay-as-you-go basis in a rapidly expanding economy.

Perhaps you read the October 1 issue of Forbes magazine, a financial publication which featured American Electric Power Company. The article said: "Unlike most utilities, which are unable to generate more than a small part of the growth cash they need, American Electric does surprisingly well."

You also neglected to mention two other small statistics about TVA's power operations—namely, that it has retained earnings of $570 million (more than twice the $250 million in cash payments to the Treasury); and that its accumulated depreciation amounts to $370 million.

Editor: We were commenting on Mr Kennedy's remarks, not on TVA's fiscal mechanics.

If you read TVA reports, you know that in the past fiscal year alone TVA's net power proceeds—net income plus depreciation allowances—totaled $100 million, a sizeable sum in relation to total operating revenues of $242 million. Surely the four investment syndicates which will bid on TVA's first revenue bond issue next month have the facts about the financial success of the TVA power program.

Editor: We are sure they are fully informed. The cost of money to TVA will be the proof of the pudding. It is of note that payments on past debt to the Treasury is subordinate to payments on the new bonds.

3. You say that Congress last year voted to send TVA to the private bond market for its money, and you draw the remarkable conclusion that the Congress was thereby "virtually admitting" that the Federal Treasury is not the proper source for financing an electric power utility operation. I frankly do not know what "image" you intended your readers to draw from this generalization.

Editor: We sought to project no image here. Rather, we sought to interpret the intent of Congress in sending TVA to the private bond market.

However, the October 1 Forbes article on American Electric Power has this statement which may bear on your point: "In this era of the 52% corporate tax, AEP has been uncommonly talented (and perhaps shrewder than average) at grabbing off certificates of necessity for the rapid amortization of its new plants—certificates which are still in force . . . With its massive write-offs, American Electric Power's effective tax rate comes to only 33%, vs the normal 52% corporate tax." Yet you say that an electric power utility operation should not look to the Federal Treasury—even though Mr Sporn's company (and others) reap huge benefits from what Sen Byrd called "bluntly, a subsidy."

Editor: Here Mr Bowers leaves hard "facts" for his own imagery. In this area, protagonists on either side can make "facts" speak for them. Resorting to our preferred "image" we could ask how an advocate of TVA, which pays no federal income tax, can argue in good faith that a tax-deferral for a tax-paying utility amounts to a dip in the federal treasury?

It would take many pages to answer fully the many misstatements and half-truths which you managed to pack into one printed page. You even suggest that TVA is not primarily a resource development agency — a statement which will surely surprise the 25,000 foreign officials from some 90 nations who have visited and studied TVA's multipurpose development program since World War II. The fact that TVA has less dollars invested in other resource development programs than it does in its power program does not mean that resource development is any less important, or significant. Has any private power company carried out the broad resource development program, including flood control and navigation, that TVA carries on?

Editor: We did not mean to suggest: we said straight out that TVA is not primarily a resource development project—noting that a full 40% of the investment is now in steam-electric generating plants. The ratio of funds invested in power to those invested in the purely resource development programs, is approximately 4:1.

As TVA Director Brooks Hays said recently: ". . . no other American undertaking has ever commanded more interest and respect in the world beyond our borders." Yet you and power company executives keep grinding out propaganda against TVA, blissfully ignoring the fact that this efficient Federal agency's record has worldwide significance in America's fight to show underdeveloped Nations that democracy can develop its resources on a comprehensive, multipurpose basis for the benefit of its people.

The final touch of irony in your editorial is your statement that "we who oppose government power should reflect that, although we must have the facts on our side, we also must achieve the art of image projection." Your editorial—which does *not* have the facts on its side—is in my opinion a masterpiece in "image projection." It is unfortunate that neither your "facts" nor your "images" serve the public interest.

Editor: We wish we might agree that our editorial was "a masterpiece in 'image projection.'"

J. Wiley Bowers, Executive Secretary
Tennessee Valley Public
Power Assn

NEW 3/4-ton Pull-A-Way
Added to WRIGHT TYPE "C" LINE!

FOUR SIZES • ¾, 1½, 3 and 6 Tons

FEATURES
- Lubricated for life
- Hooks are drop-forged
- Special alloy-steel chains
- Chain sheaves of drop-forged alloy steel
- Gear teeth cut to precision limits
- Load brake is dependable and safe
- Weights:
  ¾-ton, 12½ lbs.
  1½-ton, 23½ lbs.
  3-ton, 36½ lbs.
  6-ton, 63 lbs.

New 3/4-ton model
• VERSATILE
• LIGHTWEIGHT

ACCO

Write to York, Pa., office for complete information

Wright Hoist Division
AMERICAN CHAIN & CABLE
York, Pa., Bridgeport, Conn.

NATION'S LARGEST
FEDERAL SAVINGS ASSOCIATION

pays you 4½% on savings

• 4½% current annual rate, dividends paid quarterly • World headquarters for the savings of 150,000 individuals, corporations and trusts in 50 states, 63 foreign countries • Same, sound management policies since 1925 • $35,000,000 reserves • Resources over $1½-billion • Accounts insured by F.S.L.I.C. • Funds received by 10th of month, earn from 1st • We pay postage both ways

CALIFORNIA FEDERAL SAVINGS
WORLD HEADQUARTERS FOR SAVINGS

FREE! "California Here I Come!"—, latest issue on Golden State resorts, education, landmarks!

B-13

California Federal Savings & Loan Assn.
Box 54087, Terminal Annex, Los Angeles 54, Calif.

Please send "California Here I Come!" and Cal Fed MAIL-SAVER* to:

Name _____
Address _____
City _____ Zone ____ State _____
☐ Funds enclosed in amount of $ _____

*Trademark

A. R. Penfield has become director of advertising at Gould National Batteries, Inc, St. Paul.

In Delta-Star Electric Division of H. K. Porter Co, Inc, the following personnel changes have been made: **George S. Arneson** has become director of marketing, headquartered in Chicago; **Stuart W. Johnson** was named product sales manager of transformers for the division's Electric Service Works in Philadelphia; and at the division's Thomas Works, Lisbon, Ohio, **Walter E. Taylor Jr** was made manager of engineering, **William F. Hiel** manager of manufacturing, and **Jon A. Reynolds** manager of customer service. In the company's National Electric Division, **Irvin C. Turner** became Charlotte, N.C., branch manager.

Robert E. Cross has been promoted to sales manager for the Bermico Division of Brown Co. Also: **Robert W. Thayer** is now plant manager of Bermico's Berlin, N.H., operation, assisted by **David H. Crockett; Bernard M. Guthrie** heads the Corvallis, Ore., facility, aided by **Norman H. Desart** as operation superintendent; Vice President **Robert W. Andrews** is directing the Birmingham, Ala., plant, with **Donald Welch** as operating superintendent; and **Edward G. Spencer** is supervising operations at the Hamilton, Ontario, plant which recently went into production under a separate corporation known as Bermico Products Ltd.

Sierra Electric Corp has appointed **Robert E. V. Ramsing** national sales manager, and **J. L. Quisenberry** marketing manager. Quisenberry will still be responsible for Sierra's advertising and sales promotional activities.

Harold M. Emlein has been named operations manager of a plant being constructed in Palm Beach, Fla., by the Electronic Data Processing Division of Radio Corp of America.

Robert L. Jannen has been promoted to assistant vice president, heading sales and marketing operations at Leach Corp.

Fred B. Graham has joined Arthur D. Little, Inc, as a member of the Western Division's management services staff.

PROFESSIONAL SERVICES

BLACK & VEATCH
Consulting Engineers
Electricity—Water—Sewage—Industry
Reports, Design, Supervision of Construction
Investigations, Valuations and Rates
1500 Meadow Lake Parkway
Kansas City 14, Missouri

THEODORE D. BROSS LINE CONSTRUCTION CORP.
Steel Tower & Wood Transmission Lines
Distribution & Maintenance
175 Enfield St. Hartford, Conn.

COMMONWEALTH

SERVICES, INC.	ASSOCIATES, INC.
Management and Business Consultants	Consulting and Design Engineers
300 Park Ave.	209 E. Washington
New York 22, N. Y.	Jackson, Michigan

DAMES & MOORE
Consulting Services for Electric Utilities
Soil & Rock Mechanics Engineering Geology Geophysics
Subsurface investigations for all types of buildings, heavy equipment, and tower foundations. Ground motion, earthquake, and vibration analyses. Earth dam and earthwork design and inspection.
Chicago New York Houston San Francisco Honolulu
Los Angeles Portland Seattle Atlanta Salt Lake City

JENSEN, BOWEN & FARRELL
Engineers
Appraisals—Depreciation Studies—Property Records
Cost Trends—Special Studies—Reports for Rate Cases, Security Issues, Regulatory and Accounting Requirements
Michigan Theatre Building Ann Arbor, Michigan
NOrmandy 8-7778

PIONEER SERVICE & ENGINEERING CO.
Consulting and Design Engineers . . . Purchasing
Specialists in Financing
Accounting and other Operations
231 So. La Salle St. Chicago 4

SANBORN MAP COMPANY, INC.
Nation Wide Mapping Services
• Utility Area Base Maps
• Symbolized System Portrayal
Atlanta - New York - Chicago - San Francisco

SARGENT & LUNDY
Engineers
Consultants to the Power Industry
STUDIES • DESIGN • SUPERVISION
140 South Dearborn Street, Chicago 3, Ill.

TIPPETT & GEE
Consulting Engineers
Mechanical • Electrical • Thermodynamic
Structural Design • Studies • Supervision
Power Stations • Transmission • Distribution
Industrial Plants • Process
1382 North Second Street Abilene, Texas
214 Meadows Building Dallas, Texas

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

DISPLAYED RATE:

EMPLOYMENT OPPORTUNITIES: $25.50 per inch. Subject to Agency Commission.
EQUIPMENT & BUSINESS OPPORTUNITIES: $16.85 per inch for all advertising appearing on other than a contract basis. Not subject to Agency Commission.
AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.
EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

——RATES——

UNDISPLAYED RATE:

$1.80 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

PROPOSALS, $1.80 a line an insertion.
BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT OF 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

Send New Advertisements to Classified Advertising Div. of Electrical World, P. O. Box 12, N. Y. 36, N. Y.

ADDRESS BOX NO. REPLIES TO: Box No.
Classified Adv. Div. of this publication.
Send to office nearest you.
NEW YORK 36: P. O. Box 12
CHICAGO 11: 520 N. Michigan Ave.
SAN FRANCISCO 4: 68 Post St.

POSITIONS VACANT

Electrical Engineer, Board layout work—power, lighting, and control system; calculations; and occasional field contacts. Extremely wide variety of work with opportunity to enter consulting field and grow with progressive mid-western concern. P-4617, Electrical World.

Service Manager—Hospital equipment manufacturer needs man capable of developing and administering Service program, including training and supervision of men in installation, testing, servicing and repair of hydraulic and electrical equipment. Must be able to develop service literature and manuals. Residence in St. Louis area required. Send complete resume, including salary requirements to P-5463, Electrical World.

Utility Engineer E.E. with distribution experience and knowledge of steam generation for publicly owned utility having 8100 meters in Mid South. Water and sewer experience desirable but not essential. Non political, good salary and fringes. Submit full resume and compensation required. P-5503, Electrical World.

Electrical Engineers with B.S. Degree. Recent graduates: rapidly expanding public utility has openings for ambitious young men in the electric transmission and distribution field. Substation design, voltage regulations, system stability, protection & line construction are only a few of the fields open to qualified men with a desire to advance. Write qualifications to: Employment Office, San Diego Gas & Electric Co., P. O. Box 1831, San Diego 12, California.

SELLING OPPORTUNITY AVAILABLE

Representative wanted for manufacturer of street lighting equipment pole line specialties. Western States. Full particulars. RW-5056, Electrical World.

POSITION WANTED

Manager small system including generation, transmission and distribution. Age 44, 20 years experience electrical operations. Last 15 as plant engineer, Assist. Mgr. and Plant Mgr. in medium size steam plants. Desire more challenge. Prefer West or Southwest. PW-5551, Electrical World.

IF THERE IS

Anything you want

that other readers of this paper can supply

OR—

Something you don't want

that other readers can use, advertise it in the

Searchlight Section

SWITCHGEAR ENGINEER

AGE: To 45 years

EDUCATION: B. S. E. E. minimum

EXPERIENCE: 5 years in 5 & 15 KV metalclad switchgear application; engineering background should include some design or development work.

Challenging Position—Unlimited Potential

Send Complete Resume

Including Salary Requirement

P-5357, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

ELECTRICAL ENGINEERS and DESIGNERS

Several openings available for electrical engineers and designers experienced in powerplant (preferably hydro) design. Salary commensurate with experience. Please send complete resume to Personnel Manager.

HARZA ENGINEERING COMPANY
400 West Madison St. Chicago 6, Illinois

Wanted - POWER ENGINEER

Established mid-western manufacturing firm has opening for an Electrical Engineer to design and layout power distribution systems; lighting systems; plant-wide high-voltage distribution systems; heating, ventilating and air conditioning control systems for industrial, commercial and office buildings; and for electrical testing of existing transformers, switch-gear, relays, etc. Up to five years experience in this field required. Furnish detailed resume of experience and education, salary requirements and availability.

P-5502—Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

LARGE POWER EQUIPMENT

Prompt Stock Shipment
RENUBILT MOTORS - GENERATORS
TRANSFORMERS - CIRCUIT BREAKERS
DO YOU GET OUR STOCK LIST?
BELYEA COMPANY, INC.
51 Howell St. Jersey City, N. J.
OL-3-3334

MOTORS • GENERATORS
TRANSFORMERS
NEW - REBUILT
ELECTRIC EQUIPMENT CO.
WORLD'S LARGEST INVENTORY
CALL COLLECT CL 4-9058
P. O. BOX 51 • ROCHESTER 1, N. Y.

ELECTRICAL ENGINEERS

Permanent positions in our St. Louis Office for qualified engineers with 2 to 10 years experience, applicable to project design of Power Plants, Missile Test Facilities, Industrial Plants, and Institutional Buildings. Work includes drawing arrangement, detail development, electric circuit and illumination calculation.

Prefer applicants with working knowledge of Schematic and Wiring diagrams. Professional registrations recognized.

Many company benefits including paid vacation, holidays, sick leave and excellent employee benefits and retirement plan.

SVERDRUP & PARCEL ENGINEERING COMPANY
Engineers - Architects
915 Olive Street, St. Louis 1, Mo.

TRANSFORMERS

1—6667 kva Westinghouse, 3/60/115,000Y/13750
1—6000 kva G.E. 3/66000/2400/4160Y
1—2000 kva Nia. Askrael, 3/13800/14160Y/2400
3—1000 kva Westinghouse, 1/22900/480
3—1000 kva Westinghouse, 1/13800/480
3—1000 kva Westinghouse, 1/13800/2400/4160Y
3—1000 kva Standard, 1/44000/6900
3—1000 kva Standard, 1/69000/4160Y/2400
3—1000 kva Standard, 1/34400/480
3— 833 kva Allis Chalmers 1/60/12,000-480
3— 200 kva Westinghouse, 4800—240x480
3— 100 kva G.E., 2400/4160Y—120x240
3— 75 kva G.E., 2400/4160Y—120x240

ERIE ELECTRIC CO., INC.
26 Mechanic St. Buffalo 2, N. Y.

New Relay Protects Ring Bus, AIEE Told (*Continued from page* 55)

mum of time without loss of flexibility of adjustment.

Performance of the relay in five installations in two substations has been excellent, the authors pointed out. Of 100 faults (all on lines; no bus faults), 83 were reclosed successfully on the first try; 11 were successful second reclosures; the remaining six were persistent line faults. Since August 1959, 18 additional line faults were handled successfully, including 14 faults handled by the first reclosure.

In the discussion, R. E. Seifert, Houston Lighting & Power Co, said the relay represents a well-thought-out design, though it appears complicated at first glance. It offers possibilities for other applications.

R. L. Watt, Southwestern Electric Power Co, said the relay offers flexibility not available in conventional relay schemes utilizing the lead-follow breaker concept on ring buses. Though they have no plans for commercial availability of the relay, the authors willingly stated that the device cost about $275 excluding overheads. In answering a question of J. P. Holm, Commonwealth Associates, they said that relay speeds faster than 15 to 20 cycles are available in the device. Further, with use of proper contact material and proper adjustments, a reclosing relay in a dust-tight housing should give many years of satisfactory operation.

Another new approach in protective relaying, use of coaxial cable, was described by J. R. Linders, Cleveland Electric Illuminating Co. This application provides for protection of two 132-kv circuits consisting of two 3½-mile pipe-type cables and 1½ miles of cable and 1½ mile of double-circuit steel tower line, as well as for certain communications needs (EW, Dec. 21, 1959, pp. 75-77). The coaxial cable medium, said Linders, fills the gap in previous methods especially where several functions must be provided over reasonably short distances. It requires circuitry similar to that associated with microwave channels; thus, it can "piece out" a microwave link. The relaying of combination overhead-underground circuits presents no particular problem.

Try Coax for Pilot Relaying

Direct burial of a coaxial cable is entirely practicable, Linders stated in discussion. Right now they are working on the problem of applying a coaxial cable to an overhead line structure. Experience is needed to show that there are no unforeseen hazards when coaxial cable is routed overhead, particularly when closely coupled to magnetic fields of the transmission circuit which it is protecting.

To give a hand to relay engineers charged with the protection of multiterminal and tapped transmission lines, the Line Relay Subcommittee of the AIEE Relay Committee has put into one paper the difficulties inherent in the protection of such lines. The paper, "Protection of Multiterminal and Tapped Lines," rounds up for relay engineers the experience of others in coping with the problem.

Commenting on the subject, J. R. Linders said relay engineers should look to better and more accurate means of getting information regarding the condition on three-terminal lines. This approach, though it may cost more than usual schemes, should be viewed against the cost of the system components being protected to fairly assess its value.

Control circuit flexibility incorporated in the switchboard design is an easy way to adapt various protection schemes to the requirements of individual feeders from 2.4 kv to 34.5 kv, reported M. E. Byrne and J. N. Haroian, both of Idaho Power Co. Based on operating performance, they said a control and relay scheme for feeders serving pumping loads holds considerable promise for many urban and rural type feeders. The scheme uses time overcurrent control with instantaneous relays set to override motor inrush.

This reclose sequence is used: Instantaneous and overcurrent trip three times, with immediate, 20-sec and 60-sec reclosures. The fourth trip inserts the instantaneous relays after riding 5 to 9 sec on the overcurrent element, followed by lockout. Idaho Power also finds that the reclose and lockout counter provides a good indicator of feeder performance.

Advertising Index

Air Preheater Corp. 33
Allen Bradley Co. 35, 36
Allis-Chalmers Mfg. Co. 32
American Chain & Cable Co., Inc.
Wright Hoist Div. 94
Anderson Electric Corp. 15

Babcock & Wilcox Co. 6, 7
Bethlehem Steel Co. 67

California Federal Savings & Loan Ass'n. 94
Chance Co., A. B. 77, 78, 79, 80
Combustion Engineering Inc. 12, 13

Directory of Engineers 94
Dow Corning Corp. 37

Ebasco Services Inc. 30
Electro-Motive Div.
General Motors 86, 87
Engineers, Directory of 94
English Electric Co. Ltd. 34

Fanner Mfg. Co. 71

G&W Electric Specialty Co. 41
General Electric Co.
Apparatus Dept. ..... 2nd Cover
61, 62, 63, 65, 70
Grinnell Co. 14

I-T-E Circuit Breaker Co.
Greensburg Div. 16, 17
Victor Insulators Div. 73
Indiana Steel & Wire Co., Inc. 76

Kaiser Engineers 40
Kellogg Co., M. W. 90, 91
Kuhlman Electric Co. 38, 39

Lapp Insulator Co., Inc. 8
Line Material Industries 27, 28, 29

McCabe-Powers Body Co. 4
Moloney Electric Co. 74, 75

Ohio Brass Co. 31

Peabody Coal Co. 18
Pennsylvania Transformer Div.
McGraw-Edison Co. 68, 69
Pioneer Service & Engineering Co. 66
Pole Sprayers Inc. 76

RT&E Corp. 9

Sangamo Electric Co. 44
Searchlight Section 95
Simplex Wire & Cable Co. ..... 3rd Cover
Southern States Equipment Corp. 10, 11

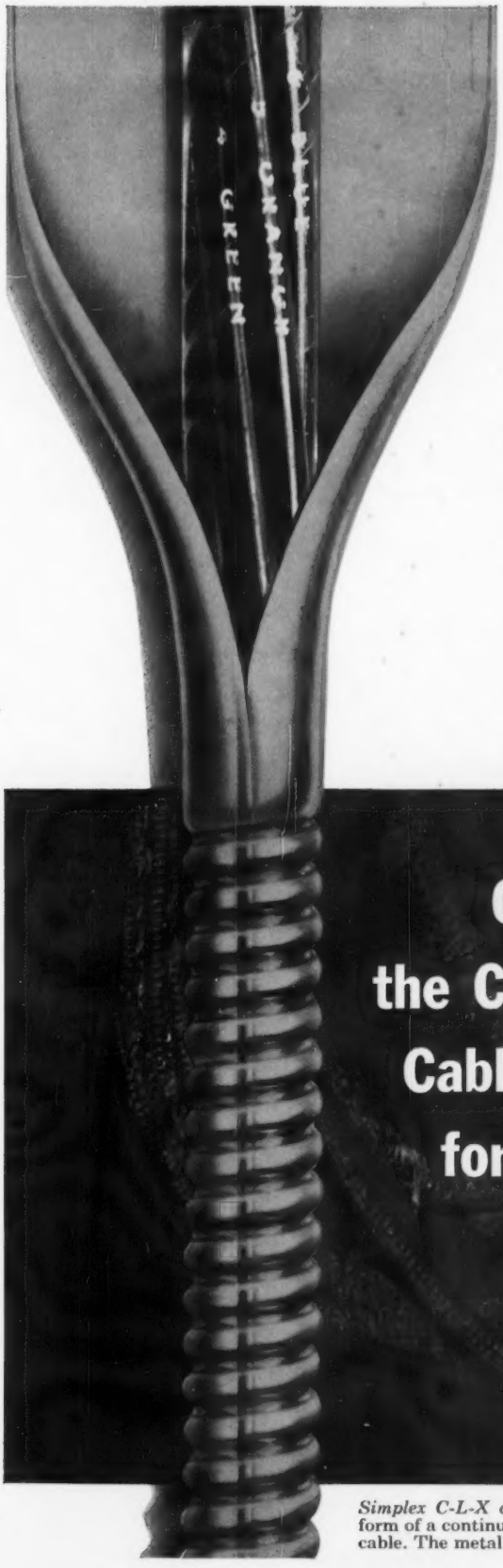
Westinghouse Electric Corp. 19, 20, 21, 22, 42, 43
Worthington Corp. ..... 4th Cover
Wright Hoist Div.
American Chain & Cable Co., Inc. 94

PROFESSIONAL SERVICES 94

CLASSIFIED ADVERTISING
F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES 95

EQUIPMENT
(Used or Surplus New)
For Sale 95



The cable you see here is *not* interlocked armor. It is Simplex' new C-L-X . . . the completely sealed cable system.

- Completely sealed against liquids and gases.
- Protected against mechanical damage by a continuous, corrugated metallic sheath.
- As pliable as unsheathed cable because of its corrugated design.
- Needs no separate duct or conduit in any environment.
- Nonferrous sheaths can be designed to function as grounds or shielding.

Simplex C-L-X is impervious to liquids and gases, is resistant to all forms of mechanical damage, and is as pliable as unsheathed cable.

Available with sheaths of steel, aluminum, copper or bronze, and with or without outer plastic jacketing, Simplex C-L-X provides the ideal solution for almost any installation, particularly those in which cable life is limited by severe ambient conditions.

Write today for illustrated brochure containing application and engineering information.

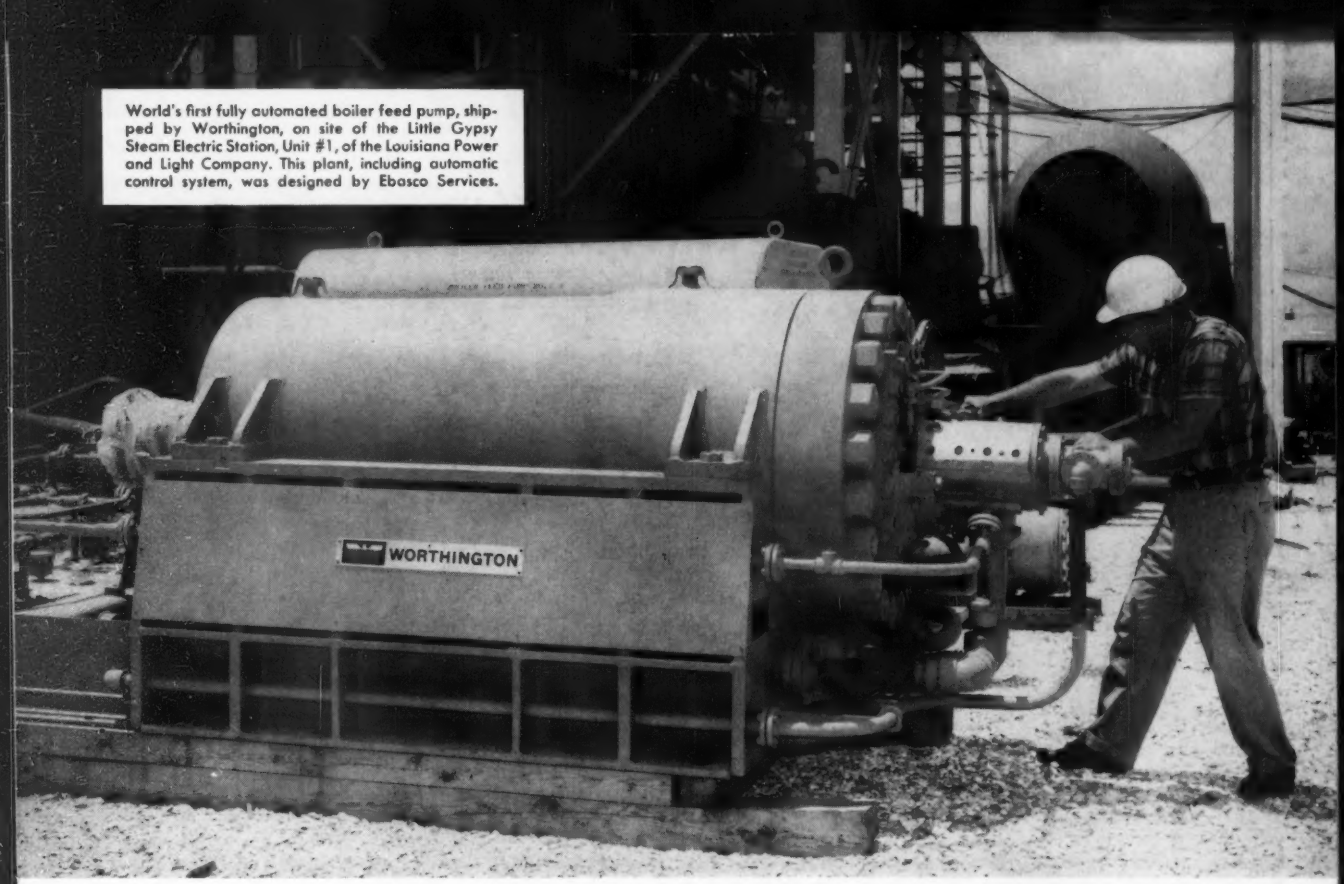
Simplex

WIRE & CABLE CO.

Cambridge, Mass. • Newington, N. H.

Only Simplex C-L-X . . . the Completely Sealed Cable System . . . is Built for Torturous Conditions Like This

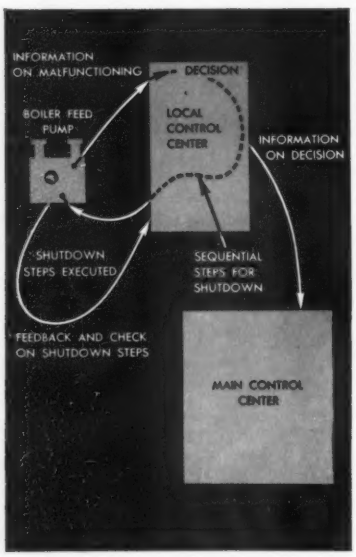
Simplex C-L-X combines cable and duct in one integrated system. Metal, in the form of a continuous flat strip, is formed into a welded tube around the insulated cable. The metal tube is then corrugated to form Simplex C-L-X.



World's first fully automated boiler feed pump, shipped by Worthington, on site of the Little Gypsy Steam Electric Station, Unit #1, of the Louisiana Power and Light Company. This plant, including automatic control system, was designed by Ebasco Services.

WORTHINGTON DELIVERS THE WORLD'S FIRST FULLY AUTOMATED BOILER FEED PUMP

Should yours be next?



Automatic decisions for load variation: routine or emergency shut-down can be locally or remotely instrumented.

Frankly, we don't know. We do know, however, that we've shipped the first high-pressure boiler feed pump for a fully automated installation. Thus the "full automation" question looms bigger with each new plant.

What do we mean by "full automation," when important components have been automatically controlled for many years? We mean the use of improved equipment and instrument design and control techniques—plus modern data processing systems—in such a way that the power plant will operate continuously at optimum efficiency under varying loads, starting and stopping units as required with maximum equipment protection.

Now, is it your turn to install fully automated boiler feed pumps? Or other power plant components? That is, of course, a matter for you and your engineers to decide. But regardless of the degree of automation for which you design, we are sure that we can help you in studying the needs for instrumentation and control of the Fluid Handling Group.

Remember, we've many years in designing and building condensers and auxiliaries, generators, boiler feed pumps, compressors, turbines and control equipment. We call it "System-Wise Experience" . . . and have prepared an Automation File on Boiler Feed Pumps from it. For this file, drop a note to your Worthington District Office. Or write Worthington Corporation, Harrison, N. J.

WORTHINGTON

PRODUCTS THAT WORK FOR YOUR PROFIT